MARINE REVIEW

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SUBJECT OF ERIE CANAL IMPROVEMENT.

Buffalo, July 30.—The fates appear to will it that rivals of the Buffalo shipping route are still falling out by the way. It is about a certainty that the Counselman venture has not made Chicago an ocean port, and is not likely to, so that we must look to some other source of diversion. The St. Lawrence route, make it what you can, sink all the money in it that can be coined, will never figure as a successful rival of the Buffalo route.

And now it comes up from New York that the deep waterways scheme has been given a very black eye in the late meeting of commercial men in New York, and whatever aid and comfort it can possibly be given by the Rochester meeting that is to follow will not be enough to put any real life into it. The difficulty all along is that dreamers and jealous rivals are combining to make the commercial waters run up hill, but they will never do anything of the sort. It is reported that New York is actually waking up and will not any longer wait for Buffalo or second her so weakly that it would be better as formerly if no help had been given at all. New York is a power in anything, but the difficulty is that she is too big to do anything with a will. We shall be much surprised now if the metropolis really comes up to the mark, even if it is found that Boston is stealing her commerce away from her.

If other people could only be persuaded that the steady advocacy of the Buffalo route by Buffalo was anything but mere self-seeking there would be short work made of the improvement of the old Erie canal. But it has always been that prejudice was stronger than judgment, so the effort to make the most of the cheapest and most available route to the sea must languish as it does, and that to the benefit of nobody. We can't eat hay, but we can lie in the manger and keep our friends, the hay eaters, out. But Buffalo is not going to give the effort up. In a short time the machinery of canal improvement advocacy will be running here again, just as though the friends of the idea were not foolish enough to run their heads together at Albany last winter and were not ready to do the same thing again this winter if they are not managed very carefully. Still, one by one the home enemies of the plan drop off. The elevator opponents that wanted the state to go into the business are out of business and there is a growing conviction that the Erie canal must be saved in some paying shape; that is to say, be enlarged for barges. All that is needed now is to come to some agreement.

Gov. Odell is going to make a thorough inspection of the canal next fall. Maybe he will come to the conclusion that it was not to the best interests of the state that he stood in the way of an agreement last winter, all for the sake of politics, and if he does he is likely to take a good measure through. He is a power in that line and he is not in the habit of doing things by halves. It is greatly to the credit of Buffalo that she is willing to take up the task alone year after year and work on the same line, intelligently and ploddingly, when everybody else is engaged in pulling the other way. We are pleased to note that the Buffalo route has never really been in much danger, but the time is not far away when something must be done or it will go and with it the best part of the lake trade also.

Let those of our western friends who have cozened with the ship canal ghost so long reflect that they have done all the harm to the route that they could, a route that begins away west of Duluth and does not end in America. It would not take a canal of proper dimensions, one that would carry wheat from Buffalo to New York for a cent a bushel, long to prove the Buffalo contention. We believe that the effort will succeed in good time in spite of mistaken and biased opposition, and that the lake trade as well as New York will be saved by the effort.

JOHN CHAMBERLIN.

PROPOSED STEEL CASTINGS CONSOLIDATION.

While no added information has been received for a day or two it is generally credited that a combination of the principal plants engaged in making steel castings is to be formed. The American Steel Casting Co., Chester, Pa., will be the nucleus of the consolidation. The additional companies to be included are: American Steel Foundry Co., Shickle, Harrison & Howard and Sculin & Gallagher Co., all of St. Louis; the Sargent Co., Chicago; Franklin Steel Casting Co., Franklin, Pa.; Seaboard Steel Casting Co., Solid Steel Casting Co., Eureka Steel Casting Co. and Pennsylvania Steel Casting Co., all of Chester, Pa., Pittsburg Steel Casting Co. and Otis Steel Co. of Cleveland. The capital is to be upwards of $15,000,000 with the prospect that the amount will be increased considerably later on. The board of directors as proposed includes Daniel Eagan, president of the American Steel Casting Co., Philadelphia; Rolla Wells, mayor of St. Louis and president of the American Steel Foundry Co.; Charles Miller, president of the Franklin Steel Casting Co., Franklin, Pa.; and W. D. Sargent, president of the Sargent Co., Chicago. It is probable that Daniel Eagan will be chosen president with headquarters at New York or Philadelphia. It was thought for a time that the consolidation might fail, but it was found that each concern entering the combination was able to subscribe for its own quota of stock, and it is on this basis that the consolidation is now being carried out. The companies in the combination make many steel castings for railroads, and it is said there will be a great saving to consumers in the number of patterns used. At the present time there are about one hundred different styles of car couplers complying with the requirements of the Master Car Builders' Association and the Interstate Commerce Commission. Most of these patents, while quite similar in many respects, are owned by as many private owners, who have ordered the same made by the steel casting companies, as orders were received from railroads.

ADMIRAL WALKER ON THE ISTHMIAN CANAL.

The report of the Isthmian canal commission will be given to the president of the United States in September. Rear Admiral John G. Walker, the president of the commission, believes that the only practicable routes for the interoceanic canal are by the Isthmus of Panama or through Nicaragua. The Darien routes, he says, are not worth considering. He thinks the canal will cost between $158,000,000 and $200,000,000, according to the route selected.

"No power was given us to negotiate for treaties or concessions," said the Admiral during the present week. "In my opinion both the Panama and the Nicaragua cuts are practicable. It is only a question of money and concessions that will decide us in settling upon a route. We may have an opportunity to buy the Panama work outright. But I do not consider this by any means certain. The Panama people have a small force at work, even now, something like 3,000 men, I believe they claim. When I was there last year I could see considerable difference in the work from what it was when I was there two years previous. They are making some progress, but I suppose they keep at work principally for the purpose of holding their concession.

"There is a good deal of sickness on the Isthmus of Panama. As far as Nicaragua goes, I would rather spend the summer there than in some parts of the United States. They have in Panama what is called pernicious fever, which is very much like yellow fever and equally as deadly. In order to make the isthmus healthy, Panama must be sewered and drained properly, and I do not know but what all of the inhabitants would die while that was being done. The last of our field parties arrived in Washington only a few days ago. At one time we had from 600 to 800 men down there, a party in Panama and one in Nicaragua, beside several in Darien. The survey work in Darien showed that there is nothing at all hopeful there. We have been at work now for nearly two years and have spent about $1,500,000 in making investigations. I cannot say which route will be the cheaper; in fact, I should say there will be very little difference between them. This, of course, is providing we can buy the Panama job for what it is really worth to us."

HEAVY GRAIN SHIPMENTS PREDICTED.

Mr. George A. Tomlinson of Duluth makes the following report to Hutchinson & Co. of Cleveland upon the grain situation as it impresses him at present:

"Harvesting began this week in North Dakota, the state that is primarily the granary of this port. With favorable weather a wheat crop of magnificent proportions will be gathered. North Dakota conditions excel all others. Estimates of the wheat crop of the two Dakotas and Minnesota vary from 190,000,000 to 250,000,000 bushels. It is very likely we will have 225,000,000 bushels. The 1900 wheat crop aggregated only 116,000,000 bushels. The grain has matured unusually early this year and by the last half of August the movement by lake will be fully under way. Reports indicate the crop will be 'clean' and of good quality, conditions of great importance in dispatching ships at elevators. In my judgment, the shipment of grain from this port in September, October and November will exceed all previous similar periods. During the three fall months of 1898 the grain shipments from Duluth were 45,000,000 bushels and in December 6,800,000 bushels. Some local authorities think we will exceed the record of 1898. The facilities for loading and storing grain are increased by the new Northern elevator, the largest here."

THE MONTH'S HEAVIEST DIVIDEND.

The largest dividend disbursement during the present month will be that on the preferred stock of the United States Steel Corporation. It is a quarterly dividend of 1¾ per cent., payable Aug. 7, and calls for $8,898,510. Checks drawn on the National Bank of Commerce, First National Bank and National City Bank will be mailed on Aug. 6. In addition to the preferred dividend a considerable sum will be disbursed on United States Steel bonds, which aggregate $304,000,000 and call for a quarterly interest payment of 1¼ per cent., or $4,800,000. The common dividend is payable Sept. 16. It has been so arranged that the dividends on the preferred and common stocks respectively will be about six weeks apart. In the application filed in the stock exchange May 16, asking for permission to list securities of the United States Steel Corporation, the outstanding stock was given as $508,486,000 preferred and $506,473,400 common, leaving in the treasury $41,513,700 preferred and $43,526,600 common. If the present rate on the preferred and common is maintained for twelve months the stock and bond holders will receive more than $71,000,000.

SAN FRANCISCO LABOR TROUBLES.

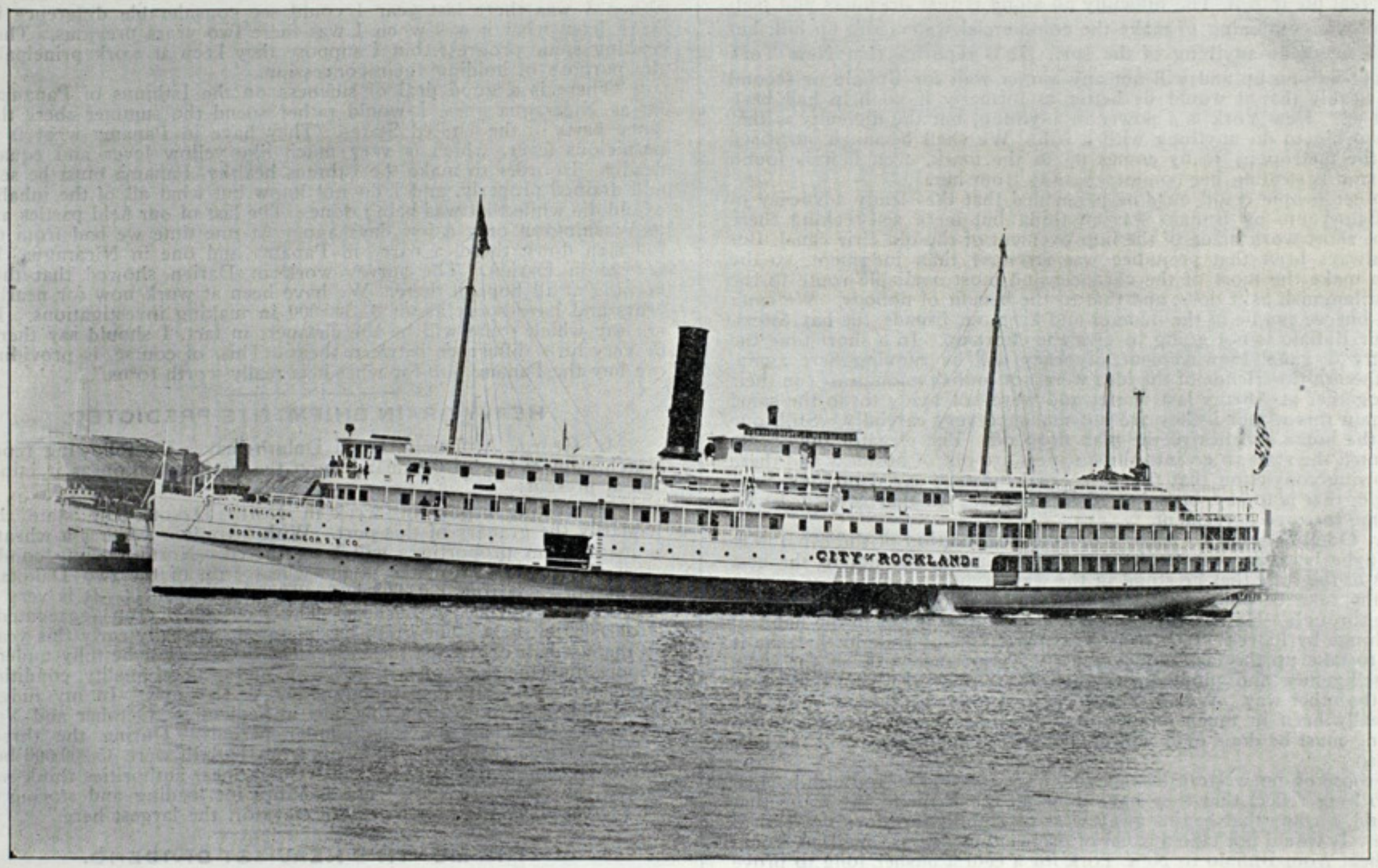
The City Front Federation of San Francisco has ordered a general strike and as a result the shipping industries of the city are paralyzed. Thousands of dollars' worth of fruit is lying rotting on the docks and other irremediable mischief to property is being done. Fifteen thousand men obeyed the order to strike on Tuesday of this week. The City Front Federation is composed of the following organizations: Sailors' Union of the Pacific, four local unions of longshoremen, marine firemen, brotherhood of teamsters, ship and steamboat joiners, porters, packers, warehousemen, ship clerks, pile drivers and bridge builders, hoisting engineers, steam and hot water fitters and coal teamsters.

When the order to walk out went into effect all the big shipping companies with one exception were left without a union man. By a special agreement entered into some time ago between the Pacific Coast Steamship Co. and the firemen's union, firemen remained on the vessels of that company. Four coasting steamers, a ship and a schooner were the only vessels that went to sea.

NEW STEAMER CITY OF ROCKLAND.

It is generally credited that the City of Rockland, the new steamer for the Boston & Bangor Steamship Co., is the finest side-wheeler plying in Maine waters. The steamer recently had her trial trip and acquitted herself well. The vessel is of the following dimensions: Length, 300 ft.; beam, 38 ft. 5 in.; depth, 14 ft. 4 in.; gross tonnage, 1,700. The passenger capacity is 800 and the freight capacity about 600 tons. The vessel was built by William McKie of East Boston and her engines and boilers were furnished by the W. & A. Fletcher Co., Hoboken, N. J. Her frame is of white oak, copper and iron riveted, and her lines are quite graceful. Besides her unusually strong construction up to the main deck the steamer has heavy hog frames to stiffen her in addition to the steel strapping which supplements the natural strength of the oak. She is planked with oak and Georgia pine with gunwale strakes of Oregon fir. The keel, stem and stern posts are of oak of unusually long lengths and the keelsons, ten in number, are of Oregon fir, 14 by 14, and are also of exceptionally long timbers.

The interior arrangements are all that can be desired. Under the deck aft is the ladies' cabin with forty-six berths; next is the midship cabin with thirty berths and then the forward cabin with thirty-six berths, a total of 112. On the main deck aft is the ladies' social hall, a large and handsome apartment furnished in the style of the grand saloon. Forward of the hall on the starboard side is the purser's office and on the port side the steward's room. The social hall, which comes next, is distinctive



in that it is covered with new rubber tiling, a novelty in steamboat use. This tiling is in separate interlocking pieces of attractive pattern—Indian red and torquoise blue. It is a most agreeable surface, smooth and noiseless, and is sure footing under all conditions. The material is said to last from ten to twenty years in public places. Altogether about the grand saloon and gallery deck are 186 staterooms. The vessel is lighted throughout with electricity and is equipped with Hyde windlass and Williamson steering gear.

GENERAL PLAN OF ARMORED CRUISERS.

Plans for armored cruisers which will be superior to foreign vessels of their type are now being prepared by Rear Admiral Bowles in accordance with the characteristics defined by the naval board of construction. As the battleships projected are to be more formidable than anything of their kind in the United States navy, the board decided to design armored cruisers which would be the peer of anything in their class in the world. The new cruisers are to be provided with a battery considerably stronger than that with which the Maryland class, the construction of which has just begun, is provided, and they are to have greater protection. It is expected that the plans will describe vessels having these general characteristics: Length, 502 ft.; beam, 69 ft. 6 in.; draught, 24 ft. 6 in.; displacement, 14,000 tons. The armament will consist of eight 8-in. guns in four turrets, two forward and aft on the keel line of the ship, one on each beam in the waist of the ship, fourteen 6-in. guns, most of which will be broadside, and a strong secondary battery. The cruisers will be designed for a speed of 22 knots.

A lake-built steel steamer, the Simon J. Murphy of about 3,000 tons capacity, which has been under charter to the Coastwise Steamship Co. of Newport News and New York, carrying coal, has been sold to the M. S. Dollar Co. of San Francisco, and will soon leave the Atlantic seaboard for the Pacific.

KEEL OF ARMORED CRUISER PENNSYLVANIA LAID.

The keel of the armored cruiser Pennsylvania has just been laid at Cramps, Philadelphia. This is the first of the new vessels, for the construction of which contracts were lately let, to be laid down. There was no ceremony attached to the keel laying. The plates were sheared, punched and fitted up in the ship shed and were placed on the keel blocks of the new cruiser and bolted into place. Then the builder's name and the number of the cruiser were fastened in front of the keel. A sister ship to the Pennsylvania, the armored cruiser Colorado, will be started later by the Cramps. By a recent decision of the navy department the two vessels are to be built alike, although at first it was intended that the Pennsylvania, unlike the Colorado, should be sheathed with wood and coppered. After the contract was signed the department decided to dispense with this. Both vessels are armored cruisers, with two 9-in. barbette turrets, and two military masts. The general dimensions are: Length on the water line, 502 ft.; extreme beam, 69 ft. 6 in., and mean draught 24 ft. 6 in. The displacement is 13,680 tons. The cruisers will have twin screw triple expansion vertical engines, and water tube boilers of the Niclausse type. The engines are designed to develop 23,000 H.P., producing a speed of 22 knots an hour. The normal coal supply will be 900 tons and the maximum bunker capacity 2,000 tons. The steaming radius with the maximum coal supply will be 10,000 knots.

The armament of the twin cruisers is unusually powerful. The main battery consists of four 8-in. breech-loading rifles, in pairs, in barbette turrets mounted forward and aft on the middle line of the ship, and fourteen 6-in. rapid-fire breech-loading rifles mounted in armored broadside. The secondary battery consists of eighteen 3-in. rapid-fire guns, eight 1-lb. rapid-fire guns, two 3-in. rapid-fire field guns, two Colt's machine guns and six Colt's automatic guns. There will be two submerged torpedo tubes, as in the battleship Maine, but there will be no torpedo tubes above water, as in all the existing United States cruisers. The thickness of armor on the water line is 6 in., tapering to 5 in., on the turrets 6½ in., tapering to 6 in., and on the barbettes 6 in. and 4 in., with a corresponding thickness on the gun sponsons.

The full complement of the Pennsylvania and the Colorado will require forty-five officers and 777 men, more than any other vessel in the United States navy. The Pennsylvania will be fitted out as a flagship and will have quarters for an admiral and his staff.

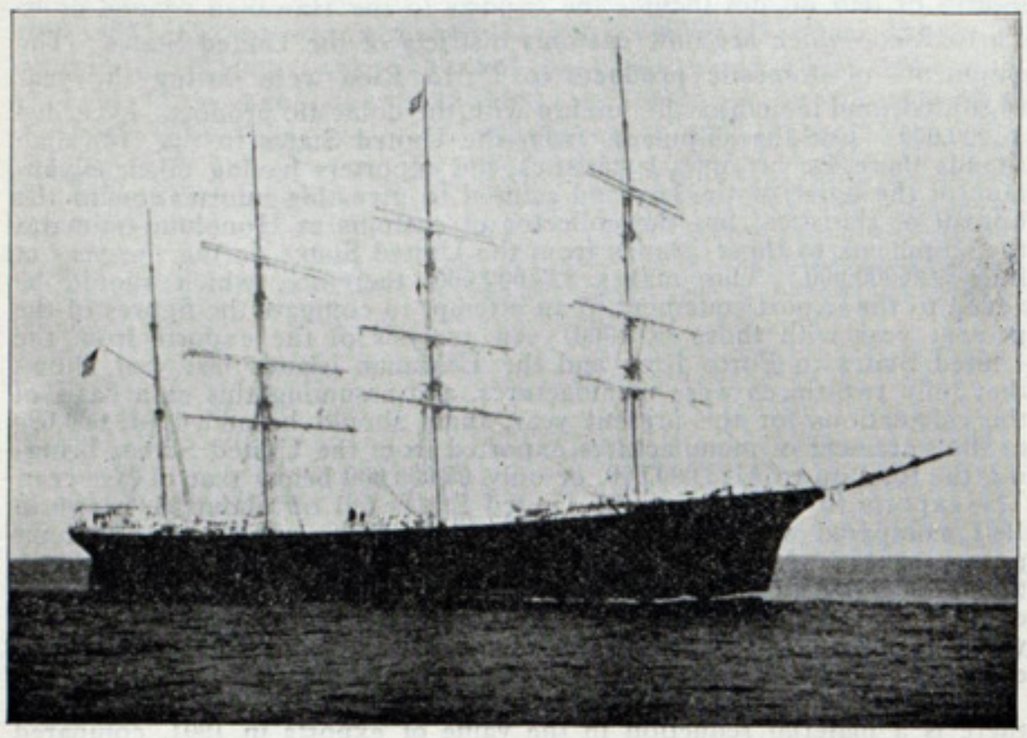
EXPANSION OF THE HAMBURG-AMERICAN LINE.

Richard Guenther, United States consul at Frankfort, has this to say regarding new lines for the Hamburg-American service:

It is reported on good authority that four new lines are to be included in the Hamburg-American service. First, the "Jebsen" line, between Shanghai and Tsintau. This line was subsidized by the German government. It is proposed to enlarge the service and extend it to Chefoo and Tientsin, the Hamburg-American line wishing to gain part of the Chinese shore trade. A second addition is the share held by the Bremen firm of Rickmers in a line operated on the Yangtze by the North German Lloyd. It is expected that the Yangtze commerce will soon increase greatly. The North German Lloyd and the Hamburg-American line in this case work together. The third project is that of a regular East Asia and San Francisco route, by which (using the overland route between San Francisco and New York) a more rapid communication with the east will be secured than via the Suez canal. The fourth enterprise is the purchase of the British Atlas line, operating between New York, the West Indies and South America.

A RACE HALF WAY AROUND THE WORLD.

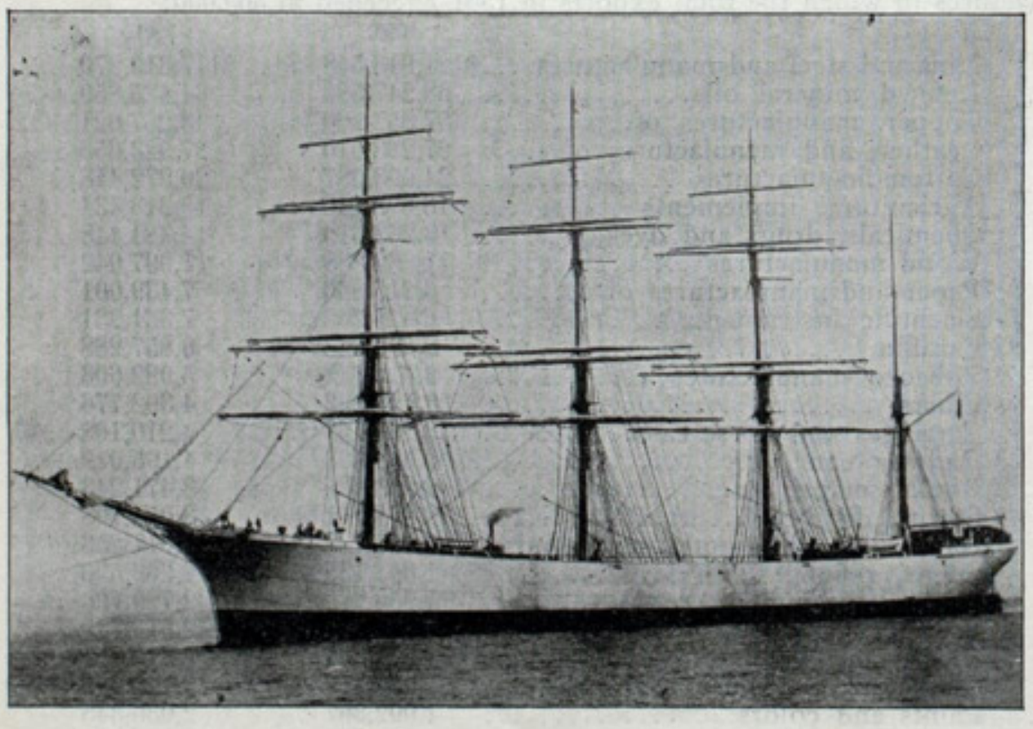
The coming race to the orient between the sailing ships Acme and Brilliant of the Standard Oil Co., now loading oil at Bayonne, N. J., for Yokohama, has excited great interest in Maine, where the Acme was built, and to old timers it recalls the excitement of clipper days when Donald McKay of East Boston and other builders tried in vain to produce a ship that would beat the Red Jacket of Rockland, Me. The Red Jacket made the passage from New York to Liverpool in 13 days, 1 hour and 25 minutes. Many ships tried to beat that run but failed. It is part of the gospel of the sea that nothing that ever carried sail could equal the speed in all weathers and in all seas of the fast wooden ships that were built in Yankeeland in the days before the war. Steam navigation was then in its infancy, and the few steamers running on ocean routes



The four-masted ship Acme, built by Arthur Sewall & Co., Bath, Me.

were slow, so that there was great profit in sailing clippers, which made the long voyages around the Horn and to the far east, carrying passengers as well as cargo. All these ships had racing models, everything being sacrificed to gain speed, and the way they traveled around the world was something surprising to the sailors of other nations. When the steamers began to crowd the sailers, just after the war, the full clipper model was discarded, because it was found that to make any money the ships must carry more, and so the half-clipper style came in. Some of these ships, like the Annie H. Smith and the Centennial and the Young America made great passages, ninety-six days from New York to San Francisco having been recorded to the credit of one of them.

In recent years very few ships have been built in Maine or anywhere else in the United States, for the reason that long distance carrying long ago ceased to be profitable except in special lines, and there is more money to be made in the building and sailing of big schooners. Only a few of the last batch of wooden ships built in the state now hail from



The four-masted ship Brilliant, built by Russell & Co., Greenock, Scotland.

Maine ports, many having been sold to foreign account and to the Pacific coast, others cut down to barges and a good many lost, and in the course of a few years the last of them will have disappeared from the registry. Now, however, Bath has taken to building ships of steel, and the Acme, which is to race the Brilliant to Japan, is one of the best of her class ever turned out at Bath or anywhere else. Besides the Acme Bath has already built the Astral, while the Atlas and the William P. Frye are to follow, the first three named being for the Standard Oil Co. and intended for the trade to the orient. The race between the Acme and the Brilliant has stirred up a lively discussion as to the sailing qualities of the two ships but there is no way as yet of reaching a satisfactory conclusion, for while the Brilliant has made a good passage from Greenock to New York, 27 days in ballast, the Acme is yet to make her first passage. The Astral, sister ship to the Acme, made the passage from New York to Shanghai in 129 days, arriving out June 17, but that is nothing to go by, for there is often a great difference between sister ships in the matter of speed.

The Brilliant was built at Port Glasgow, and is 375 ft. long, 51½ ft. beam and 3,609 tons net register—622 tons larger than the Acme. The Acme is 332 ft. long, 45 ft. beam and 2,987 tons net register. She will carry about 1,500,000 gallons of oil, while the Brilliant is expected to carry about 1,800,000 gallons. Both are considered to be first-class ships and it is said of the Acme that she is the best sailing ship yet turned out in America, being built by well paid men, of the finest materials and fitted with all the latest labor-saving and safety-securing appliances. Whether she will sail fast is another question, but, notwithstanding the fact that she was designed more for carrying than for racing, there is reason to expect that she will keep along with the best of them. She is a four-master, long-yarded and will carry a great spread of canvas, while her master, Capt. Reuben S. Lawrence, is one of the ablest deep sea sailors that ever went from Maine. Capt. Lawrence, who is said to be a descendant of Commodore Lawrence of the famous United States frigate Chesapeake, has been thirty-four years at sea, twenty-one years as master. His first ship was the George Peabody, his second the Columbia; then he commanded the Triumphant, and lastly, before he took the Acme, the John Currier. It was while in command of this vessel that he ran up the American flag at Cebu in the Philippines.

Neither ship has as yet made a trip in cargo and the outcome is, of course, problematical. The Standard Oil Co. is building a fleet of sailing ships at Bath and on the Clyde and there is naturally great rivalry among the natural adherents of both localities. The great corporation itself is not unmindful of the contest. Mr. Philip Ruprecht, who manages the foreign shipping department of the Standard Oil Co., writing to the Review, says that an effort will be made to let them go to sea together and he naively adds: "Each captain will naturally try to get there first."

MORGAN LINER TO BE LAUNCHED SATURDAY.

Newport News, Va., July 24.—The Morgan line steamship El Siglo will be launched at the ship yard next Saturday morning and will be christened by Miss Susan S. Usher, sister of Lieut. Com. Usher of the United States navy, who will be executive officer of the United States battleship Illinois, which will be placed in commission here early in August. The fact that El Siglo will be launched ahead of the Pacific Mail leviathan Siberia does not preclude the possibility of a double launching, as the Morgan liner El Libre is still on the ways and almost as far advanced as El Siglo. The Siberia and El Libre will go overboard in September and probably together. The public, especially the business men, is anxious to see a double launching, as it will unquestionably draw at this time one of the largest crowds ever seen here on a like occasion. The largest launching crowds in the country, probably in the world, are seen at Newport News, as was evidenced when the battleships Kearsarge and Kentucky went overboard in the presence of probably 33,000 people, when the battleship Illinois was launched in the presence of something like 25,000 spectators, and on the occasion of the launching of the Pacific Mail leviathan Korea in March last, when the number was estimated at from 20,000 to 25,000. The launching of a Morgan liner is such a frequent thing here that usually the crowds are not large, numbering probably 5,000 and 6,000 people, but nevertheless the Morgan ships are the largest and fastest in the coastwise service, and those who have inspected them say there are none finer. El Siglo is being built under the superintendence of Horace See of New York, consulting engineer for the Morgan and Cromwell lines, and is an improved type of the United States auxiliary cruiser Buffalo, which broke the record for speed between Manila and New York by arriving at New York May 13 last in thirty-six running days. The Buffalo was formerly the Morgan liner El Cid and was built here in 1892.

El Siglo is built entirely of steel and has the following dimensions: Length, over all, 406 ft.; length between perpendiculars, 380 ft. 8½ in.; molded breadth, 48 ft.; depth molded to awning deck, 33 ft. 9 in.; gross tonnage, 4,666; net, 2,905; displacement, 6,000 tons. The engines are of the vertical triple expansion type. Steam is supplied by three double-ended boilers. The ship is lighted throughout by electricity and has all conveniences for loading and unloading freight. It will have excellent quarters for the officers and crew, for which the Morgan line is celebrated.

The drawings for the keel of the new battleship Virginia have just been completed at the ship yard and the keel will go down in a few days. Rapid progress has been made on the drawings for other parts of the ship. The Virginia will be the first of the five new battleships to go down. Her sister ships will be the Nebraska, Georgia, New Jersey and Rhode Island, each of which will be 435 ft. long, 76 ft. 2½ in. beam; 23 ft. 9 in. draught, and 14,590 tons trial displacement. The drawings for the other warships under contract are fast taking shape.

The monster North German Lloyd liner Main, which was partly destroyed in the great Hoboken fire and is being rebuilt here at a cost of nearly $1,000,000, will be taken out of dry dock this week and her completion is now a matter of only a short time. As she lies in dry dock No. 1 the Main presents the appearance of a ship which has been built in the dock, with her new plates on and a staging extending her full length on both sides, resembling a ship on the ways. She will re-enter the passenger and freight service of the North German Lloyd and will be as good as new when turned over. This is the largest repair contract ever awarded in this country, if not in the world.

The 7-in. tunnel leading from the old dry dock to the new pump house was completed this week. The tunnel leading from the new dry dock to the new pump house is 9 ft. in diameter. The two dry docks are now as easily handled as the one was before the $1,500,00 basin was finished.

The Holland-American Steamship Co., which operates a line out of Newport News, will add six more ships to its line, three of which will be new, now being under construction abroad.

The North German Lloyd Steamship Co. is constructing another training ship at Bremerhaven. The experiment of training officers for the North German Lloyd service has proved so successful that the company finds one ship not sufficient. The vessel will be built of steel, will have a double bottom throughout and will be fitted with six water-tight bulkheads.

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During the present week stories have emanated from Chicago and elsewhere that the ship builders of the great lakes are behind a movement looking to the abrogation in part of the treaty of 1817 with Great Britain. This treaty prohibits the presence of more than one warship from either country on the great lakes. It therefore forbids the building of warships on the great lakes. While there was at one time need of this treaty it is no longer necessary. This somewhat ancient treaty acts merely as a blight upon a legitimate private business. It really serves today no other purpose. The newspaper dispatches say that the lake s' ip builders on the one hand and the coast ship builders on the other hand are preparing for a terrible conflict before congress this winter—the one to abrogate the treaty and the other to defend it. It is represented that the coast ship builders are painfully aware that the lake builders can underbid them in warship construction, and that, therefore, they will do everything they can to prevent them from competing. All of this is to be entered under the classified heading of "important if true." The trouble is that it isn't true. The lake ship builders are not turning a hair over the treaty of 1817, and as for the coast ship builders, they have probably never heard of it. There isn't very much money in government work, and by the time the builder gets it he has earned every cent of it. Moreover, the issue is not one for congress to settle. A treaty is a contract. It cannot be broken without the consent of both parties. Treaties are prepared by the executive end of the government and submitted to the senate for ratification. The treaty of 1817 is one of the measures which the high joint commission had under consideration at its last session, and which it filed away in a pigeon hole with the Canadian boundary and other questions when it adjourned. The next meeting of the high joint commission is not yet announced. Secretary Hay says that he does not know when the high joint commission will meet again, but that until it does nothing can be done with the treaty of 1817. The passage of Mr. Boutell's bill would be merely the expression of the congressional opinion. It would have no effect in law whatever.

The Review was in hopes that it could announce this morning the settlement of the great steel strike, but such is not, as yet, the case. There was every reason to believe when the present week opened that the strike would be settled on Tuesday upon the terms outlined by the steel corporation. The corporation did not concede anything in its terms because there is nothing actually to concede. The hopeful feature of the situation, as it exists today, is the fact that the strike has not spread. It involves the same force that it did in the beginning. Indeed an extension of the strike would be obviously detrimental to those engineering it as it would deplete the resources wherewith the present strikers are maintained. It costs a lot of money to conduct a strike of this character. No violence has been attempted anywhere and indeed there has been no occasion for any. The great corporation has treated its men admirably. It has offered to the strikers all that could with decency be asked. It has indeed adopted a magnanimous attitude toward a body of men who have, without warrant or cause, endeavored to cripple it at a crucial period in its history. The only thing it has refused to do is to violate the constitution of the United States which forbids coercion—and it would be coercion of the worst sort for the corporation to demand of its non-union employees that they instantly become union men. The leaders of the amalgamated association seem to be playing more for position than for anything else at present. It cannot be that the sense of the great body of workmen is behind them. In nine cases out of ten if a cause is right—whether it be capital or labor—it will win; if it is wrong it will lose. In this case the steel corporation is clearly right in its attitude and it is to be hoped that the present week will see the recognition of this fact by the strikers.

Admiral Dewey's flagship Olympia will be a much better ship when she goes into commission than she was on May 1, 1898, when the battle of Manila was fought. About $500,000 has been spent upon her. Ornaments commemorating her great victory have also been attached to her. Naval Constructor William J. Baxter, head of the department of construction and repair, first conceived the idea of these ornaments, and he at once set about obtaining the consent of the navy department to put them on. Some of the bronze used in casting the two pieces, stem and stern, was taken from the Olympia, and this gives added value to them. The stem ornament is the more elaborate and really is a work of art. A winged Victory holds high above her head an eagle, which she is about to launch in the air. Victory's wings lie against the sides of the ship's prow. The stern piece consists of a shield with a mass of scroll work on either side.

UNITED STATES AS AN EXPORT NATION.

DECREASES IN VALUES ARE MORE APPARENT THAN REAL—DETAILED ANALYSIS OF THE EXPORTS.

Exports of manufactures from the United States show an apparent decrease of $23,342,583 in the fiscal year 1901 compared with 1900. The detailed figures having just been completed by the treasury bureau of statistics, it is now practicable to analyze this decrease and see how much of it is real and how much of that which is real is due to temporary causes. As has already been explained by the bureau of statistics, the export figures of 1901 do not include the exports to the Hawaiian islands or to Porto Rico, which are now customs districts of the United States. The shipments of domestic products to Porto Rico were during the year $6,861,917, and including the foreign with the domestic products, exceeded $7,000,000. For the shipments from the United States to the Hawaiian islands there are no official statistics, the exporters having taken advantage of the letter of the law and refused to give this information to the bureau of statistics; but the collector of customs at Honolulu estimates the shipments to those islands from the United States during the year at fully $20,000,000. This makes $27,000,000, therefore, which should be added to the export statement in an attempt to compare the figures of the present year with those of 1900. An analysis of the exports from the United States to Porto Rico and the Hawaiian islands last year shows that fully two-thirds were manufactures, and assuming this as a basis of the calculations for the present year, there should be added $18,000,000 to the statement of manufactures exported from the United States, bringing the total up to $428,000,000, or only $5,000,000 below that of last year. The exports to China from the United States fell off about $5,000,000 in 1901, compared with 1900, the fall of course being entirely due to temporary causes. An examination of our exports to China in 1900 shows that practically all are manufactures, so that the temporary reduction of exports to China due to the unsettled conditions in that country, coupled with the absence of export statistics for Hawaii and Porto Rico, fully equals the entire decrease in our exports of manufactures.

In four important articles of our manufactured exports, however, there is a material reduction in the value of exports in 1901, compared with 1900. These articles are: (1) copper, a reduction of $14,500,000; (2) iron and steel, a decrease of $4,500,000, which is entirely accounted for by the absence of figures on the exports to Hawaii, to which the exports of iron and steel alone from the United States last year were over $5,000,000; (3) mineral oils, in which there is a reduction of $3,800,000 in value, and which is due entirely to a reduction in the export price of oils, the number of gallons exported having actually increased from 817,599,499 gallons in 1900 to 870,498,964 gallons in 1901; (4) cotton manufactures, a reduction of $3,700,000, which is entirely due to the temporary falling off in our exports to China, the decrease in exports of cotton goods to China in 1901, compared with 1900, being $4,183,000, or more than the entire decrease in total exports of cotton manufactures. Taking the entire available list of exports of manufactures, numbering about 200 distinct articles or classes of articles, it is found that 60 per cent show an increase in value, as compared with last year, while in a considerable number of those showing a decrease the loss is entirely due to the reduction in price per unit, the actual quantities being in several cases greater and the values less than last year.

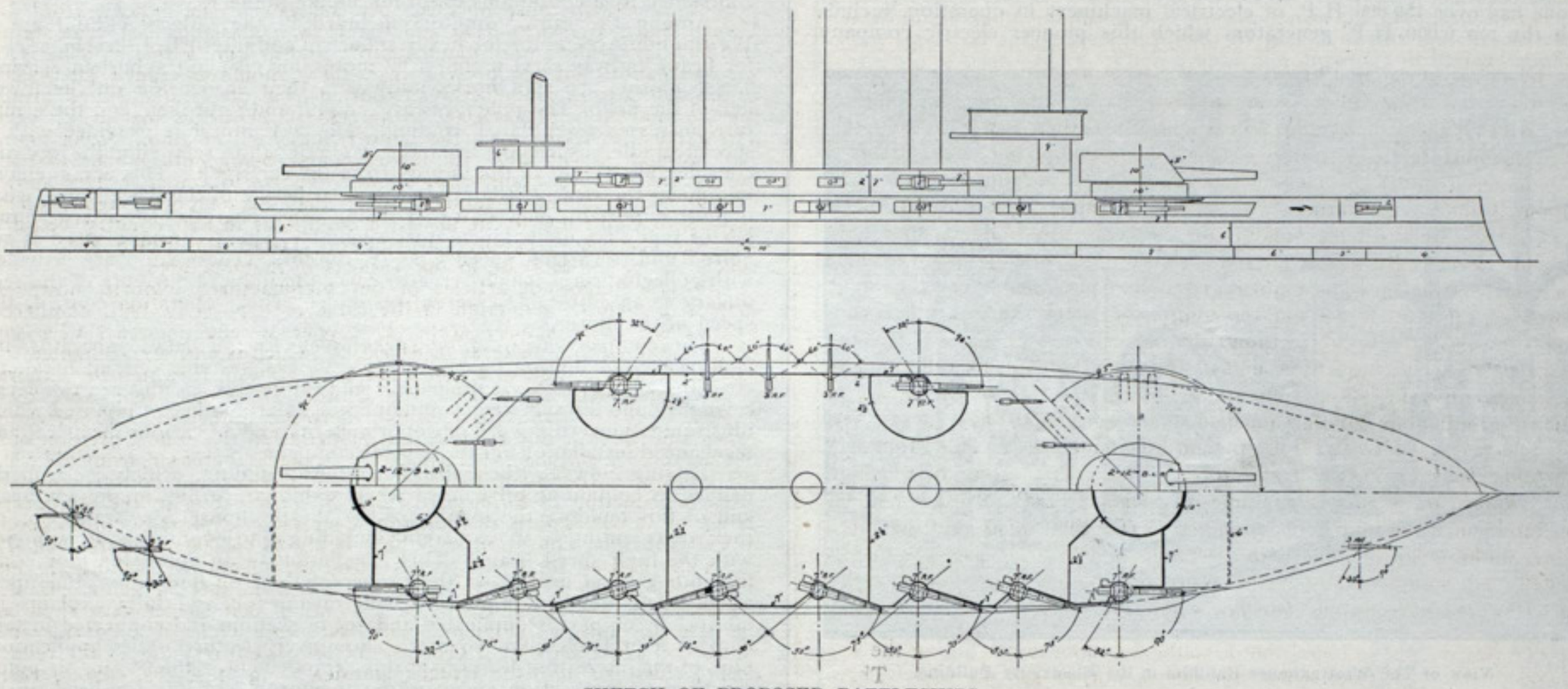
The following table shows the exports in 1900 and 1901 of all manufactures in which the total exports in 1901 exceeded $1,500,000:

	1900.	1901.
Iron and steel and manufactures	$121,913,548	$117,319,270
Refined mineral oils	68,247,588	64,425,859
Copper, manufactures of	57,852,960	43,267,021
Leather, and manufactures of	27,293,010	27,923,653
Cotton manufactures	24,003,087	20,272,418
Agricultural implements	16,099,149	16,313,434
Chemicals, drugs and dyes	13,203,610	14,384,448
Wood manufactures	11,232,838	11,097,042
Paper and manufactures of	6,215,833	7,439,001
Scientific instruments	6,435,766	7,361,231
Paraffin	8,602,723	6,857,288
Tobacco manufactures	6,010,141	5,092,603
Fibers	4,441,833	4,302,776
Carriages and horse cars	3,794,138	4,210,108
Railway cars	2,558,323	4,195,019
Books, maps, etc	2,943,435	3,471,243
Spirits, distilled	2,278,111	3,054,708
India rubber and gutta percha mfs	2,367,788	3,017,253
Sugar, refined	1,004,135	2,969,596
Musical instruments	1,958,779	2,780,796
Bicycles	3,553,149	2,515,729
Clocks and watches	1,977,694	2,340,751
Glass and glassware	1,936,119	2,126,309
Paints and colors	1,902,367	2,036,343
Brass manufactures	1,866,727	2,007,450
Starch	2,604,362	2,005,865
Malt liquors	2,139,216	1,723,040
Gunpowder and other explosives	1,891,604	1,712,102
Marble and stone manufactures	1,677,169	1,638,314
Soaps	1,774,024	1,569,180
Wool manufactures	1,300,362	1,542,682

The ship building interests at San Francisco are feeling the blighting effects of the strike. The Union Iron Works, in particular, has been seriously crippled. The fine steamer Spokane, intended for excursions in northern waters, would have been in commission before this had the strike not intervened. The boilers of the huge steamer Alaskan will be placed in position next week and only a short time will elapse before the big twin-screw freighter will be ready for her trial trip. Four gangs of riveters have been put on the transport Sherman in an effort to hurry the work along. Until recently 500 men were at work upon this vessel but the strike has greatly interfered since.

SKETCH OF THE PROPOSED BATTLESHIPS.

On this page will be found a sketch of the proposed battleships authorized in the last naval act and upon which the naval board of construction is now engaged. The plan represented in the sketch is the plan of the majority. The principal difference between this plan and that of the minority is that the minority plan provides for superposed turrets. The majority plan provides for single turrets. Regarding the general features, only the outline can now be given as they are yet in a formulative state. Later the Review will devote considerable space to a discussion of this type. The plan provides for a battleship 450 ft. in length, 76 ft. in beam and 24 ft. 6 in. mean draught. The displacement will be 15,600 tons. This displacement will give a ship considerably larger than anything in the present navy. The hull alone will weigh about 7,000 tons, while the armor will weigh about 3,700 tons. The total coal capacity will be about 2,000 tons; total load displacement, 16,900 tons; deep load draught, 26 ft. 4 in.; speed, 19 knots, with an indicated H.P. of 20,000. The battery recommended by the majority is to consist of four 12-in. guns in two 10-in. armored turrets, twenty 7-in. guns in casemates, and twenty 3-in. guns. Eight of the 7-in. guns are enclosed in individual armor, four on the upper deck and four on the gun deck, firing ahead and astern.



SKETCH OF PROPOSED BATTLESHIPS.

The remaining twelve guns are located on the gun deck in a central casemate battery. The machinery is protected by a 10-in. armor belt, tapering to 4 in. fore-and-aft beyond the machinery space, and the other protection consists of armor 7 and 6 in. thick, except the 12-in. turrets where it is 10 in. thick. Two battleships are to be constructed upon this plan.

THE GEORGIAN BAY ROUTE TO THE SEA.

Taking the two interviews in the Review of last week with Mr. Charles Counselman and Mr. W. F. Purdy of the Northwestern Steamship Co. the Ottawa Herald thus discusses the Canadian waterway to the sea:

"It is more evident every day that the Georgian bay canal is the only scheme which will solve the problem of cheap lake-ocean route. Everyone interested in lake marine enterprises has been watching with curiosity the experiment inaugurated this year by the Northwestern Steamship Co. of Chicago in through traffic from that city to Europe. The three vessels of the line have made their first round trip and the president of the company says: 'It is most too early to determine what the outcome of this venture will be. We have had many things not to our liking to contend with in our early experience, but it has been clearly demonstrated that a line of ships can be operated between Chicago and Europe with perfect safety and dispatch.'

"There has been trouble, however, with the high rates of insurance charged, equal to $1.25 per $100 of cargo. This is based on the supposed extra risk of the canal and river trip and the rates will have to be lived down. Mr. W. F. Purdy, manager of the company, also has this to say:

" 'The company is well satisfied with the Canadian waterway as it exists, for vessels of the size of our ships. However, before this waterway can be much used it must be deepened to allow the passage of boats drawing 18 feet or more. This company is well satisfied that such a project is feasible, and hopes at an early date to see the commencement of the building of the Georgian bay canal, which, in our opinion, will be the route for the deep water canal which is bound to come.'

"As has already been pointed out the deepening of Canadian canals has always been behind the development in the size of freighters in the upper lakes and it is only by the construction of the deep waterway by the Georgian Bay-Ottawa route that Canada can reach the position of accommodating the large vessels which now find their way to Buffalo and can only be utilized on that route until such time as Canada provides a waterway for them to the ocean. The lake freighter, it is generally admitted, has reached the maximum of development.

"The Canadian Sault lock was opened in 1895 and the Poe lock in 1896 with a depth of 20 to 21 ft. on the sills. The increased draught had been to some extent anticipated by the building of ships which could not be fully loaded on a draught of 16 ft. Several exceeded 2,000 tons and a few 2,500 tons. These ships were designed to carry about twice the register but up to the end of 1894 the maximum cargo was less than 3,800 tons, showing that the depth of water in the channels did not permit full loading. During the next two years about thirty ships were built which slightly exceeded 3,000 tons net register, and with the improved condition of locks, and channels, the maximum cargo rose to 6,244 tons. In 1898 three ships of more than 4,000 tons register were in service with a maximum cargo of 7,840 tons; in 1899 the maximum cargo was 8,339 tons; one ship carried close on 10,000 tons in 1900.

"The economy of transportation in these large ships has been so marked that the building of ships of less registered tonnage than 2,000 for through freight business from western lake ports to Lake Erie ports has practically ceased. The largest ships now in use on the lakes have a length of 500 ft. over all, and a beam of about 52 ft. Considering how rapidly the cost of a ship increases with its length and how difficult it is to secure structural strength without increase of draught, it seems reasonable to conclude that no very marked further increase will take place. This ratio between length and draught has been lately very carefully considered by the British Institute of Naval Architects, and the cost of various lengths of ships estimated in proportion to the depth. This conclusively proves the greater cost of transportation in large ships per ton of cargo on a limited draught, and the economy of transportation in large ships with draught increasing with length. It has been shown that the most economical ships for a 20-ft. draught would have a length of 480 ft. and a breadth of 52 ft. This analysis, therefore, supports the idea that the limit of size of lake boats has been reached unless the channels and the harbors are made deeper. With all the money that has been spent on the Canadian canals it is apparent from the remarks of Mr. Purdy that they have just fallen short of the requirements and that it is to the completion of the Georgian bay canal that the big freighters are looking to obtain a profitable grain route to the sea."

TESTING THE POLAR CURRENTS.

Arrangements have been made by Capt. Shoemaker, chief of the revenue cutter service, to place a number of specially prepared casks, designed by Rear Admiral Melville, engineer-in-chief of the navy, on ice floes in Behring sea, to test the direction of the currents that flow from the polar region. There are fifty of these casks, each 28 in. long and 16 in. in diameter, painted black so as to be seen easily and pointed at each end. Inside each are directions in half a dozen languages to be followed by anybody who finds a cask. He is asked to write to the nearest United States consul, giving the latitude and longitude, when the cask was found, the date and the number of the cask. He is also asked to plug up the cask again and turn it adrift. It is expected that in this way some information of value to mariners and Arctic explorers will be obtained. Admiral Melville said that the idea was to demonstrate the drift of the Behring Strait. The casks, he explained, were to be placed on the highest hummocks of flow ice. The revenue cutter Bear is going as far as possible to the northward and westward of Herald island and as close as possible to the American archipelago to deposit them. Admiral Melville said that the casks were expected to demonstrate whether the pack drifts from the Arctic were to the westward or to the south and east, into the Atlantic. If they came out between Spitzenberg and Greenland they would go across the North Pole, he said, and if they came out between Nova Zembla and Franz Josef Land the current would have a southern cant.

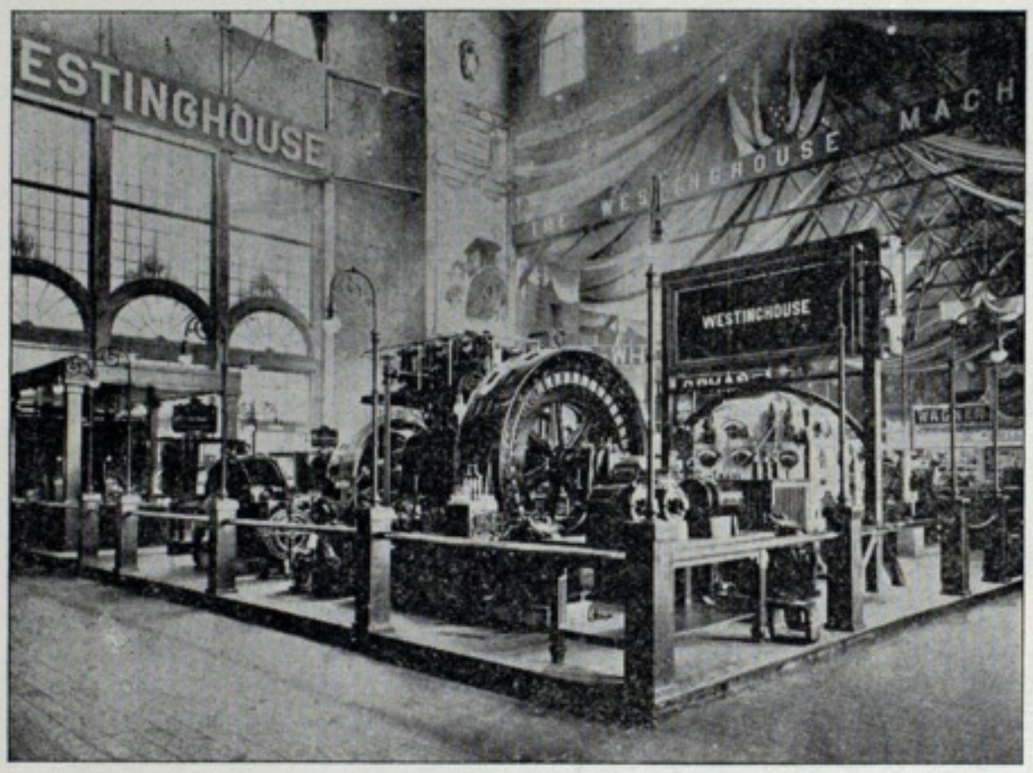
According to the Hamburg Börsenhalle a new source of ore supply will be opened at Narvik, Norway, after the completion of the new Ofoten railway in January, 1903. About 16,000,000 tons of the 862,000,000 tons said to be lying at Kirrunavaara-Luossavaara have already been sold to German consumers and the transport of the greater part of this large quantity has already been contracted for by the Hamburg-American line. The export from Narvik will amount to about 1,500,000 tons per annum for a start, but as soon as the mines in the Dunderlandsdalen are in working order the ore export from the northern part of Norway will probably reach about 4,000,000 to 5,000,000 tons per year.

WESTINGHOUSE EXHIBIT AT THE PAN-AMERICAN.

IT IS ONE OF THE MOST EXTENSIVE DISPLAYS OF MACHINERY AT THE EXPOSITION—A TRULY COMPREHENSIVE SHOW.

It is altogether fitting and proper that Buffalo, situated by the great waters of the north, should invite the peoples of all countries to an exhibition representing the material growth of America. To celebrate the achievements of a century of progress in the western world is said to be the aim and purpose of the Pan-American exposition, and although there may have been one or two expositions exceeding it in extent, it is heralded as the most effective ever attempted. The point of greatest significance in any exposition is the thought that countries, like individuals, become provincial unless they exchange their resources, industries, products, inventions, arts and ideas. By increasing the countless articles needed by man, the machinery of the world has brought prosperity, wealth and leisure, which in turn have given birth to the beautiful in art. It is, therefore, of the greatest importance that the electrical and mechanical inventions be brought together.

Worthy of the exposition as a whole are the exhibits of the Westinghouse companies. It was in a broad and liberal spirit that these companies decided to make an exhibit at the Pan-American, for in the city of Buffalo and vicinity the Westinghouse Electric & Manufacturing Co. alone has over 150,000 H.P. of electrical machinery in operation, including the ten 5,000 H.P. generators which this pioneer electric company



View of The Westinghouse Exhibits in the Electricity Building.

installed at Niagara Falls, at a time when the largest electrical machine built was about 2,000 H.P. in capacity; it is this installation that has made possible the most brilliantly lighted of expositions and contributed so successfully to its operation.

To the visitor at the Pan-American exposition the numerous industrial enterprises associated with the name Westinghouse are in the main familiar. Almost every traveler by rail knows that his safety and comfort are in a large measure due to the Westinghouse air brake, which for thirty years has been the standard appliance for arresting the motion of trains, 1,250,000 of these brakes being now in service throughout the world. Those familiar with engineering affairs are acquainted with the very extended use of the steam and gas engines built by the Westinghouse Machine Co. Those who use electrical machinery, whether for lighting, power or traction, know the apparatus built by the Westinghouse Electric & Manufacturing Co. Equally well known are Westinghouse, Church, Kerr & Co., whose work practically covers the entire field of engineering as applied to power systems and their application to transportation, lighting and industry; the Union Switch & Signal Co., manufacturers of every known variety of automatic and semi-automatic railroad signals—makers of frogs and switches and of mechanical, pneumatic and electrical interlocking mechanisms of all kinds; the Sawyer-Man Electric Co., makers of incandescent lamps, whose product has been on the market for over twenty years. These are the remaining Westinghouse companies which have joined in a common exhibit.

Beneath the central dome of the electricity building and to the right and left of the main entrance to the railway exhibits building, occupying in all over 6,000 square feet of space and truly representing the progressive spirit of this century, the exhibits of these companies have been placed. The dome of the electricity building is tastefully draped with hanging green and lavender bunting, making a background upon which numerous strings of Nernst lamps festoon off from a large 2,000 candle power lamp placed in the center. There are over a hundred 400 candle power Nernst lamps that contribute to this illumination, which is the first public exhibition of the Nernst lamp in America and a notable introduction of one of the greatest developments that has been made in electric lighting.

The operation of two gas engine generating sets is one of the features of greatest interest in the electricity building. The large unit consists of a 300 H.P. three cylinder, four cycle gas engine, direct coupled to a 2,200-volt, two-phase, revolving field alternator. The smaller unit is a three cylinder, four cycle gas engine, direct connected to a 125-volt, direct current generator. The power furnished by the large unit is employed partly in supplying current to 130 Nernst lamps at 220 volts, and partly in operating numerous Westinghouse induction motors applied to stationary service.

The small gas engine generating set is used for exciting the large alternating current generator, for lighting the switchboard, and for charging the storage sparking outfits for both gas engines. It is used also for operating the motor-generator outfit and for lighting four large electric signs, two of which are placed over the main entrances of the electricity building. The switchboard for controlling these generators is equipped with the latest type of measuring instruments, switches, circuit breakers and auxiliary apparatus. Other standard switchboards for lighting and power service are in place. A 375 K. W. alternator, revolving field type, 7,200 alternations, is of particular interest. Of transformers there are to be seen a complete set of the company's O. D. transformers from ¼ to 50 Kilowatt; two sizes of Manhole type transformers, and two 100 Kilowatt self-cooling, oil-insulated transformers. The latter are used to lower the voltage of the 180 K. W. machine from 2,200 to 110 volts, at which potential they supply the four incandescent signs. These transformers present no radical departure from the excellent type which the Westinghouse company has standardized.

One of the most novel attractions in the electricity building is a high voltage sign. It consists of two large glass plates covered on the back with metal foil, with the name "Westinghouse" in its center. An alternating pressure having a maximum of 40,000 volts is applied between the foil on the back and the metal letters on the front. As the potential is raised a fringe of violet light appears about the letters which, gradually increasing in intensity, culminates in a myriad branched lightning discharge that plays continuously over the surface of the plate and is accompanied by a continuous crash not unlike thunder.

Among the railway motors included in the railway exhibit are a Westinghouse 56 motor for heavy suburban and interurban service, a 50-C for heavy railway service, and a 69 motor for city and suburban service. These motors are split horizontally with their suspension on the lower half of the field. The pole faces are smooth and unbroken, and the armature possesses a ventilated winding. The 50-C motor is provided with a special cradle suspension from the car axle, thus removing the not inconsiderable weight of the motors from the car truck. This arrangement minimizes the wear of the rails, increases the life of the wheels and, what is most important, makes an easy riding car. There is also a large number of type "C" induction motors adaptable where constant speed is required, and of variable speed type "F" motors. These latter are provided with collector rings which serve to carry the induced currents of the secondary to an adjustable external resistance, whose operation controls the speed of the motor.

The company also exhibits a complete line of detail apparatus, including meters, lightning arresters, fuse blocks, switches, circuit breakers, etc. Included in this comprehensive and interesting exhibit are two large revolving photograph stands containing a great number of pictures which illustrate engineering work of importance, as well as various electrical and mechanical installations of the several companies.

Passing now to the railway exhibits building, which is properly defined as containing all flanged wheel exhibits, we find in the southeast end of this building the exhibit of the Westinghouse Air Brake Co. A rack representing a six-car train, including the locomotive, is equipped with the high speed brake. This installation of an apparatus now coming into general use shows the proper method of application and operation. An attendant is present who operates it and fully explains its merits. Each part is duplicated and cut in section, and connected in tandem to its relative part, so as to show every feature of its application. One of the interesting features of this arrangement is the 9½-in. air pump top-head cut in section and working in unison with the top-head on an operating pump, showing in detail the movement of the very simple valve motion of this device.

The air is supplied by four motor-driven duplex air compressors, which are also part of this exhibit. These compressors are especially adapted to supply compressed air for air brakes on electric motor vehicles as well as various other industrial uses. A complete equipment of both the straight air and the storage system of air brakes for electric cars is so arranged on the platform as to show their application to the car. The American automatic slack adjuster, in addition to being shown in connection with the six-car high speed brake train, is also attached to the cylinder on a neatly designed model engine truck, likewise a model locomotive frame with three pairs of drivers connected, and a complete equipment for a passenger car. These models are so designed as to show the proper method of applying this device to the standard equipment, and its operation in automatically regulating the brake piston travel.

WESTINGHOUSE FRICTION DRAFT GEAR.

The Westinghouse friction draft gear suitably mounted on full size models of draft rigging, which show its application to different forms of cars, both of the wooden and the pressed steel type, is on exhibition. There are also on view complete full sized apparatus cut to show in detail its mechanical construction. This simple but effective attachment for the draft gear of cars should be examined by all railroad men, as it is one of the most valuable inventions of the present time. The rapid increase in the size of cars, trains and motive power has increased the breakage of draft gear to an enormous degree. Many attempts have been made to lessen the large shocks incidental to the operation of heavy cars and locomotives, but at the present time none have as successfully met these requirements as the Westinghouse friction type, which enables an engineer to handle a heavy freight or ore train with perfect security and with the maximum power of his engine. The gradual absorbing of the shocks and the practical freedom from spring reaction which the Westinghouse friction draft rigging gives, makes it nearly impossible even in severe service, to break a train in two or to break its draft gear. The great saving power of this device is at once apparent, when it is recollected that from 30 to 70 per cent of all crippled cars owe their condition to defective draft rigging.

ELECTRIC POWER BRAKE AND CAR HEATING APPARATUS.

The necessity of using some sort of power brake to control railway cars operating in urban and interurban service, suggested itself immediately that electric traction became practicable. The Westinghouse electric brake and car heating apparatus shown in full operation at the exhibit more nearly approximates the ideal brake for electric cars than any other appliance heretofore invented. The apparatus consists of two elements, a brake and a car heater. The brake may be installed and used independently of the heater, but the operation of the heater is dependent upon the

use of the brake, the produced total being derived from energy that would otherwise be wasted. This combination of a magnetic track brake with a wheel brake of maximum power produces a braking effect greatly in excess of any heretofore attained. Moreover, cars equipped with the complete apparatus are heated without using the line current, and therefore without cost for the electrical energy employed in heating.

This system is shown in operation in two exhibits. First, a standard single truck electric car is in constant service on a track extending from the main exhibit in the railway exhibits building to a point east of the building some 250 ft. This car is equipped with the electric brake and car heater complete, and is in charge of a regular street car motorman, who is in readiness at any time to demonstrate the operation of the system to those interested. When in action powerful magnets force the brake friction shoes upon the rails and set up a strong magnetic attraction between the shoes and the rails, while at the same time the drag or back action of these magnet shoes throws in action a system of levers that apply to the wheels brake shoes of the regular type. The current for exciting the magnets is supplied by the motor, which through the proper wiring of the controllers is at this time operated as a generator. With this electric brake system it is impossible to skid the wheels, and any degree of braking power is secured from the slightest effect up to a brak-

View in the Railway Building, showing Exhibits of The Union Switch & Signal Co., and The Westinghouse Air Brake Co.

ing effect exceeding the weight of the equipment. In the second display a double track of the maximum traction type equipped with two 40 H.P. motors and with the electric brake, is operated on a short section of track by a stationary controller. This equipment shows the enormous braking power of the apparatus and the absolute freedom from skidding of the wheels. The smooth action of this brake is one of its chief features, there being no shock or sudden jolts during its application.

THE WESTINGHOUSE AUTOMATIC AIR AND STEAM COUPLER.

This arrangement, as its name indicates, is so designed that the air and steam pipes usually carried underneath the cars are coupled automatically whenever the cars themselves are coupled and with even greater certainty, there being no locks, catches or other parts, which require manipulation by the train men. In coupling it is only necessary to push the cars together and when uncoupling to pull them apart. This device permits cars to be coupled or uncoupled with the maximum rapidity and certainty, and makes it unnecessary for train men to go between the cars. Arrangements are provided for opening and closing, from the side of the car or the platform, the cocks in the train pipes. A pictorial representation of the development of the power brake from the earliest forms of hand brakes is an interesting feature of the Westinghouse Air Brake Co.'s exhibit. These pictures, some of them of almost full size, are arranged chronologically, so that the progress made by each improvement is readily seen and the complete advance in the art of braking railway vehicles from the most primitive to the most modern methods is clearly shown.

EXHIBIT OF THE UNION SWITCH & SIGNAL CO.

The space occupied by the Union Switch & Signal Co. is located just west of the Westinghouse Air Brake Co.'s exhibit. It contains three of the most important signalling systems owned and manufactured by them—the Westinghouse electro-pneumatic interlocking and signalling system, the "Wireless" system of automatic electric block signalling, and the high-speed electric train staff system. The electro-pneumatic exhibit is located at the west end of the space and consists of a two-lever section of the latest pattern, electro-pneumatic interlocking machine, a double arm iron post signal, a dwarf signal and a switch-and-lock movement operating a single switch point complete with detector bar, rocker shaft, electric switch, valve cylinder, etc. These appliances are connected and working. They represent a part of the signalling required for a single track main line turn out. Sections of some of the principal parts are also displayed. The working of the wireless system of automatic electric block signalling is shown on a model track 50 ft. long, divided into two blocks and representing one line of a double track railway with a side track connected at both ends for returning the model engine or car without running against traffic. The switch at the west end is also equipped with a switch instrument and indicators to illustrate the protection provided against misplaced switches, or trains from sidings entering on or fouling the main track.

Two of the Union Switch & Signal Co.'s latest type of electric, style B semaphore signals—a single and double arm—are operated automatically from the model track and the complete exhibit shows plainly the working of automatic home and distant block signals under the wireless systems. Several of the separate appliances used in this and other systems are on view, including semaphore mechanisms and motors, battery chutes, relay boxes, cranks, wheels, jars, etc. Two of the high-speed electric train staff instruments connected and working show the practicability of operating trains on single track railroads by means of this system and without the use of train orders. Photographs and drawings of various appliances and plants built and installed by the Union Switch & Signal Co., together with a view of their new and greatly enlarged works at Swissvale, Pa., are also a part of the exhibit.

PRODUCTION OF IRON ORE IN 1900.

John Birkinbine has completed for the United States geological survey the statistics of iron ore production in the United States in 1900. The total production was 27,553,161 gross tons, against a total production in 1899 of 24,683,173 tons, showing an increase of 2,869,988 tons. The increase was almost wholly in Michigan and Minnesota. The production by states and territories in 1899 and 1900 is given in the following table, in gross tons:

States and Territories.	1899. Gross tons.	1900. Gross tons.
Michigan	9,146,157	9,926,727
Minnesota	8,161,289	9,834,399
Alabama	2,662,943	2,759,247
Virginia and West Virginia	986,476	921,821
Pennsylvania	1,009,327	877,684
Wisconsin	579,798	746,105
Tennessee	632,046	594,171
New York	443,790	441,485
Colorado	307,557	407,084
New Jersey	256,185	344,247
Georgia and North Carolina	284,364	336,186
Montana, Nevada, New Mexico, Utah and Wyoming	54,148	132,277
Ohio	53,221	61,016
Kentucky	35,384	52,920
Missouri	22,720	41,366
Connecticut and Massachusetts	29,611	31,185
Maryland	3,428	26,223
Texas	14,729	16,881
Iowa	.....	2,137
Total	24,683,173	27,553,161

MORE IMPORTS AND LESS EXPORTS OF BRITISH STEEL.

Whatever may be said of the British supremacy that still exists in the steel industry as regards foreign trade, it is a fact that the lessened demand from the United States and competition in the past few years from American manufacturers are telling in the annual statistics. Reports just prepared by the British Iron Trade Association show that British imports of iron and steel increased from 56,684 tons in 1860 to 101,020 tons in 1870, 275,407 tons in 1880, 385,660 tons in 1890, and 759,289 tons in 1900. Over the whole period the imports of iron and steel have increased thirteen-fold in volume. The values of British iron and steel imports over the same period have increased from £711,626 in 1860 to £1,304,848 in 1870, £3,634,215 in 1880, £4,474,379 in 1890, and £12,866,731 in 1900.

In the last six years the United Kingdom has imported iron and steel worth not less than 50 millions sterling. In the six years ended with 1865 the corresponding imports were valued at only £4,871,000, and in the six years ended with 1880 at £14,930,000. The increase since 1895 has, therefore, been very material, compared with previous periods of corresponding duration.

An examination of the returns of British exports of iron and steel over the last thirty years shows that the quantities exported in the ten years ended with 1900, although considerably more than the quantities exported in the ten years ended with 1880, were materially under the total quantity sent out of the United Kingdom in the ten years ended with 1890. In the last-named decade there were five years during which the annual exports exceeded 4,000,000 tons, whereas in no year of the decade ended with 1900 did the total reach that figure. The total quantity of iron and steel exported in the ten years ended with and including 1900 was 33,064,000 tons; in the ten years ended with 1890, 38,529,000 tons; and in the ten years ended with 1880, 27,907,000 tons. Hence it appears that, while in the last ten years our exports show an increase of 5,157,000 tons on the exports for the ten years ended with 1880, they show a decrease of 5,465,000 tons on the ten years ended with 1890. The decline in imports is due mainly to the lessened demand from the United States.

Work is progressing rapidly on the new four-masted wooden schooner being built at the yard of Gardiner G. Deering, Bath, Me. The vessel will be launched Sept. 25.

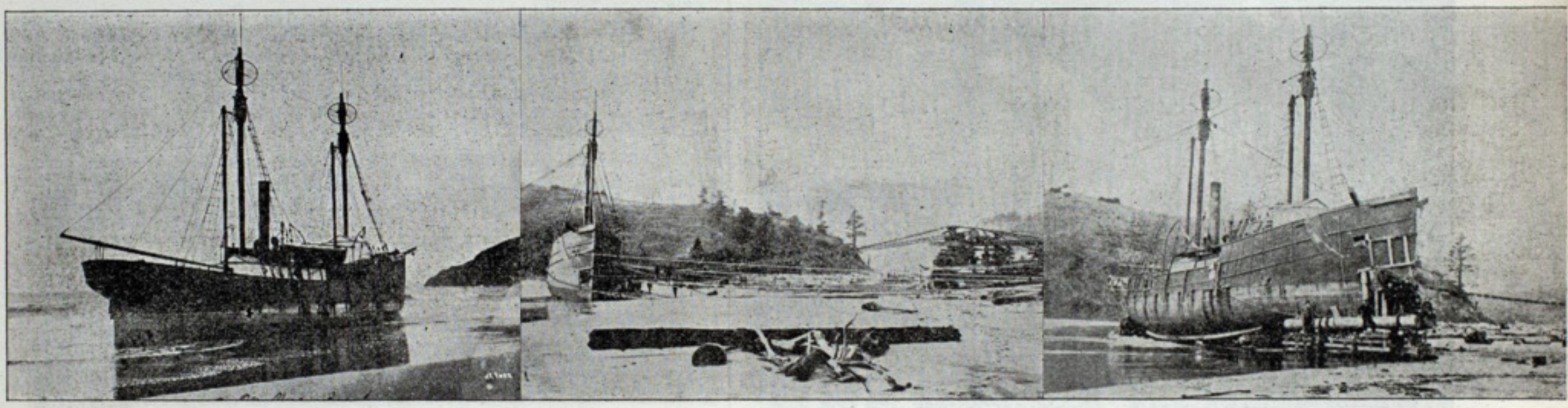
NOVEL MEANS OF LAUNCHING A VESSEL.

Two years ago, during a violent storm, the Columbia river light-ship No. 50, stationed off the Oregon coast, was torn from her moorings and stranded high and dry upon the beach north of Cape Hancock. The United States light-house board advertised for bids for the work of returning her to her native element. Several bids were submitted, among them a bid by Allen & Roberts of Portland, Ore., who outlined a plan which involved the taking of the vessel overland a distance of 2,000 ft. and launching her in the waters of Baker's bay on the Columbia river. Owing to its novelty this bid was summarily rejected by the light-house board and a bid from one of the other bidders to take the vessel out to sea was accepted. The bidders, however, found considerable difficulty in restoring the vessel to her native element and after a prolonged struggle gave up the attempt. Much time had meanwhile elapsed. The light-house board then accepted the bid of Roberts & Allen to take the vessel overland. At the time the original tender was made the vessel lay head on in a convenient position for the overland journey, but in endeavoring to get her out into deep water by the seaward route the contractors succeeded in turning her nearly broadside, with her stern on the beach, and were then compelled to abandon her. Allen & Roberts were, therefore, met with the difficulty of raising her from the 6 or 7 ft. of sands surrounding her and turning her bow to the shore. The story is probably best told in the words of Mr. Andrew Allen, who in writing an account of the undertaking to the Review, says:

"We built up a crib work of logs, upwards of 20 ft. in height, over which we passed the cables which we fastened to the bow. These chains passed over a rolling log some 2½ ft. in diameter on the top of the crib work. This was done for the purpose of getting a lifting pull upon the bow when the power was applied. In this manner we pulled her something like 125 ft., turning the bow toward the shore. When she was turned in the proper direction her bow was imbedded about 7 ft. in the sand and the stern about 6 ft. In making this turning the vessel went over partially on her beam ends, so that her deck stood at an angle of nearly 45°. We then straightened her up by placing large logs on either side of her, upon which we placed the screws with which we lifted her into a vertical position. At this stage it seemed necessary to put chains under the vessel at the bow and stern, for the purpose of helping to lift her out of the sand in which she was buried. This was accomplished by stretching a chain parallel with the ship on one side, leading it across the bow and attaching it to a capstan capable of pulling 70 tons. Some excavation was made with shovels in order to get the chain down as far as possible from the surface before the strain was applied. Then, when the power was applied a steel bar, some 30 ft. in length and sharpened chisel fashion at one end, was used for the purpose of loosening the sand under the keel at the bow, so as to allow the strain to gradually draw the chain under the bow and back to the desired position. The same procedure was adopted at the stern, and thus, in a short time, chains were placed under the vessel where, under different methods, a month's time had been employed without success. This chain was fastened at either end to a large log supported by a cribbing of timber raised upon a plank foundation, constructed of 4 by 12 stuff 2½ ft. in depth.

"Before using this plank foundation we had attempted to use logs and had succeeded at one time in getting the vessel raised, ready to start on her shoreward trip, when a heavy storm came up, washing the logs, which we had used as foundation, from under the ship and allowing her to settle back into her former bed. During much of the preliminary work we were embarrassed by heavy southwest winds, high tides and rain and hail storms, making it exceedingly difficult for the men to work, or to accomplish anything when working. Much of the sand around the ship partook of the nature of quicksand, so that when it was stirred or walked over to any considerable extent it became soft and springy. Much of the time the men were compelled to work knee-deep in water and sand. Passing over several mishaps resulting from the storms, we finally succeeded by the means suggested, using our screws upon the plank platforms before mentioned, in lifting her out of the sands to a height of between 12 and 13 ft., which enabled us to place under her a cradle made of timbers and constructed as follows: Two timbers, each 25 ft. in length by 12 by 24 in., were placed under the bow, transversely to the length of the ship, 9 ft. apart, with a similar arrangement at the stern. Then, on top of those timbers other timbers were laid, extending from the keel and higher up from the side of the vessel out to substantially the end of the first mentioned long timbers. These timbers were connected by other timbers, running parallel with the ship, and under the ends of these long timbers, projecting from the sides of the ship, were placed oak shoes, two under the end of each timber, some 4 ft. apart, which shoes in turn, when the vessel was lowered ready for pulling, rested upon oak rollers, which in turn rested upon a plank track. This arrangement gave four bearings under the ship and permitted her being hauled over an uneven surface and along a crooked route. Heavy cables were put around the stern of the vessel, extending along her side and through her hawse pipes, to which were attached the tackle blocks, to which power was applied by means of capstans worked by horses. With this arrangement the ship was taken up the beach over the uneven ground of the peninsula across a swamp and finally down a grade to the beach of Baker's bay, where her further progress was stopped in order that repairs could be made upon he while she was out of the water. The rate of progress averaged about 175 ft. per day and the distance traversed from shore to shore was about 2,000 ft. I did not measure the altitude of the highest point traversed by the ship on her landward journey, but it has been variously estimated at from 30 to 40 ft."

The vessel was successfully launched last month in the waters of Baker's bay upon rollers, in the same manner that she crossed the peninsula. This method was decided upon in preference to building the usual ways adopted for launching on the coast, because the water in the bay is shallow for a long distance out and it was feared that launching by the customary method would result in the vessel sticking her nose in the mud. She was therefore taken out upon the roller plan to a sufficient depth to float her without difficulty or danger. The light-ship is now at dock in Portland undergoing some necessary refitting before resuming her station.



ON OCEAN BEACH. READY TO PULL. PUTTING CRADLE UNDER THE SHIP.

COLUMBIA BEATS THE CONSTITUTION.

In a contest for the Astor cup on Monday of this week the Columbia beat the Constitution. In a fair breeze, varying in force from 10 to 14 knots, the Columbia forged ahead of the Constitution by two minutes and fifty-four seconds over a 38-mile course. The Columbia gained over each leg of the course, beating the Constitution thirty-two seconds in 13½ miles before the wind, two minutes nineteen seconds in beating 18 miles and three seconds reaching on the last leg, which was 6½ miles in length. The sea was comparatively smooth, a northeast wind early in the morning knocking it down. It was a fair and square beating and no one has any excuses to make for the Constitution. There were no flukes, no interferences and no hardening or softening of the wind, except on the first leg, when the Columbia made quite a gain through bringing up a freshening breeze. This would have been overlooked if the new yacht had been able to hold the Columbia turning to windward, but she did not, and this was very disappointing to all. The trouble with the Constitution seems to be that as she is now rigged it is impossible to keep her gaff from swinging on the wind as she should. The weight of wind in her club topsail swings the gaff off and this makes her go to leeward instead of pointing high and footing where she looks. This error is to be remedied, if possible, and the Constitution will at once go to Bristol to have her new rig stepped. The new spars are ready and it will not take long to make the change and it is expected that when the yacht races again she will be very much improved and able to beat the Columbia handily. It is possible that some changes may be made in the trim of the yacht while she is at Bristol. Mr. W. B. Duncan, Jr., was seen on board the tender Mount Morris shortly after the Constitution got to her moorings. Speaking of the race, he said:

"The Constitution was beaten because she was not fast enough. The boat would not go and I do not know what is the matter with her. I fully expected that the Constitution would run the Columbia at least five minutes to the leeward mark. Instead the Columbia beat us. She brought up a better breeze and perhaps I made a mistake in not luffing out. I shall not race the Constitution again in her present shape. It is simply a waste of time and to no purpose. I think that the fault of the boat is that the gaff swings too wide, and stops her going to windward. The new rig for the yacht is ready at Herreshoff's and I shall telegraph for the riggers at once to get to work. This new rig will not alter the yacht's sail plan at all. The lower mast is five feet longer than the present mast, but the new topmast will be shorter than the one now on the boat. It has been stated that the boom is to be shortened. This is not so. The object of putting in a longer lower mast is to change the lead of the peak halliards and I think when the sheets are trimmed flat with the new rig we shall be able to get the gaff in and do much better when going to windward. The mainsail will have no more hoist and the yacht will not have an inch more canvas. I think that it will take about a week to make the change and then we shall be ready for more racing."

One fare for the round trip to the Pan-American exposition at Buffalo via the Nickel Plate road beginning June 1 and continuing the entire summer; good returning within ten days from date of sale. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, Ohio.
84, Aug. 1.

INSPECTION OF AMERICAN SHIP YARDS.

Engineering of London lately sent a commissioner to the United States to visit the ship yards and report upon conditions as he found them. He was evidently charged to take note of the employment of special tools and machinery in ship construction. The first of his articles, an editorial, is particularly interesting to the lake region. He said:

"Often as the attention of ship builders at home has been directed to the question of pneumatic riveting, one requires actually to see the plant at such works as those of the American Ship Building Co. at Cleveland and Chicago Consolidated lake yards. One is then able to appreciate what a persistent pursuit of this method of riveting will achieve in simplicity of arrangement and in thoroughness. At Chicago, when the writer visited the yard, the bottom portions of the frames of a steamer, some 420 ft. in length, were in place, the plates of the inner bottom were for the most part fitted, and the bottom shell plating was well advanced. This seems to be in accordance with the methods there employed; the bottom plates, being prepared off templets made in the mold loft, so that they are ready as soon as the lower frames are erected, and are worked into the ship without any wating for the side frames. Even the bilge plates, for the midship portion of the ship at least, are punched and rolled and lie ready alongside until such time as the side frames are up and ready to receive them. The forenoon of the day of the writer's visit had been attended by a heavy rain storm, and all hands had been knocked off; but under the bottom of the steamer above mentioned a compressed air main, some 5 in. in diameter, lay, running the whole length of the ship; T branches occurred at various positions, and from these flexible branch pipes were led both to port and starboard for the supply of air to the pneumatic tools. On each side of the keel three riveting machines were in place, as left by the workmen, so that on the bottom of that steamer it was obvious that six mechanical riveters were working; this number being in addition to the other pneumatic tools for rimering and caulking. The bottom was kept as clear as possible of shores, and the impression given was, perhaps, that a little less care was taken in this respect than at home; which is perhaps justified by the fact of the ship having no declivity (in view of the subsequent launching being made broadside), a lesser number of shores and the total absence of bilge blocks (at this stage at least) was thus allowable.

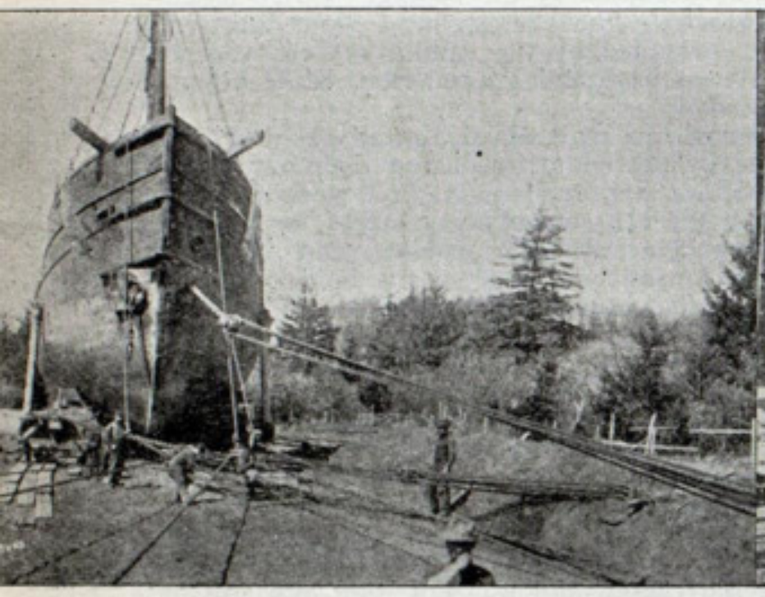
"In another steamer, launched a few days previously and lying afloat, the writer was more successful in seeing pneumatic riveting actually in progress. The main air pipe was led along the deck and branches taken off as required through the hatches to the parts below. Some six squads of riveters were working on this ship, and all with pneumatic tools, no sign of hand riveting being visible from stem to stern. The portions in process of riveting were girders beneath the upper deck, and the lower edges of gussets to the lugs attaching the side frames to the margin plates. Why these had not been completed earlier was not quite obvious. They were in the nature of odd work, and the possibility of applying pneumatic power to them was correspondingly remarkable. The work produced by the pneumatic riveters is to all appearance excellent. Even the keel rivets seemed all that could be desired. The appearance of perfection is supported also by the tests made at the Chicago yard in the way of cutting up samples riveted together for the purpose, and by the still more practical consideration of the difficulty actually experienced in cutting out pneumatically-driven rivets in the frequent cases of repair which have presented themselves. The difficulty, said to be experienced at home, of getting the plates well closed with pneumatic work, is overcome in America by the screwing up being done by a special squad, leaving nothing for the riveters but the actual work of driving the rivets. Fairness of holes, at least when the work is first put together, cannot be said to be a feature at Chicago. The three-ply work especially might well be better than it is. The pneumatic rimering, however, brings things into a fairly satisfactory condition before riveting is commenced.

"With the very large development of pneumatic working, it is rather noticeable that at the Chicago yard appliances are in some respects distinctly behind first-class appointments at home. The bottom plates are worked in long lengths, covering fourteen frame spaces; the bilge plates, both upper and lower strakes, cover only seven frame spaces; the reason being that to this day the length of rolls (some 16 ft.) at the works determines the limit of these plates. The plate edge planer matches the rolls in its want of capacity, and requires two shifts of a long plate to complete one edge. No joggling is yet resorted to, and the management is not convinced of the material advantage to be got therefrom. In this ship yard there is at present one gantry or trestle structure surmounted by a travelling crane, the whole being of the type that has been so much discussed of late years.

"Naturally, if one wishes to see modern labor-saving appliances on a bolder scale, one must go to the large establishments, such as Cramp works at Philadelphia or the New York Ship Building Co.'s works at Camden, opposite Philadelphia. As is well known, the former works have three gantry structures. Each is surmounted by a double cantilever crane, so that six ships under construction are served by these appliances for handling the material. At Camden the roofs at present erected cover three bays—one over the fitting out basin, the other two over building berths, and capable of taking two ships in the breadth. Electric cranes, suspended from the roof, traverse these bays. At the Camden works the problem set by the management seems to a casual observer to be how to carry on work differently from the way it is done elsewhere, especially in Britain. The mold loft is a beehive indeed, although there are only some four ships under construction, and none of them has any very special feature about it. Apparently nothing is shaped without a mold from the loft, and, further, nothing is done by hand. The frames are set cold and a tool something like a bean squeezer is used for the purpose. So far as possible also the tool is taken to the work instead of the work to the tool. If an odd hole has to be drilled in fitting together the parts of, say, a hold stringer (this fitting is done on shore), a pneumatic drill is brought to do it. The above remark as to hand work does not quite apply to riveting. For some reason or other, probably a temporary one, the only shell squad of riveters the writer saw were riveting by hand, notwithstanding the fact that close beside them pneumatic rimering and caulking were freely in progress.

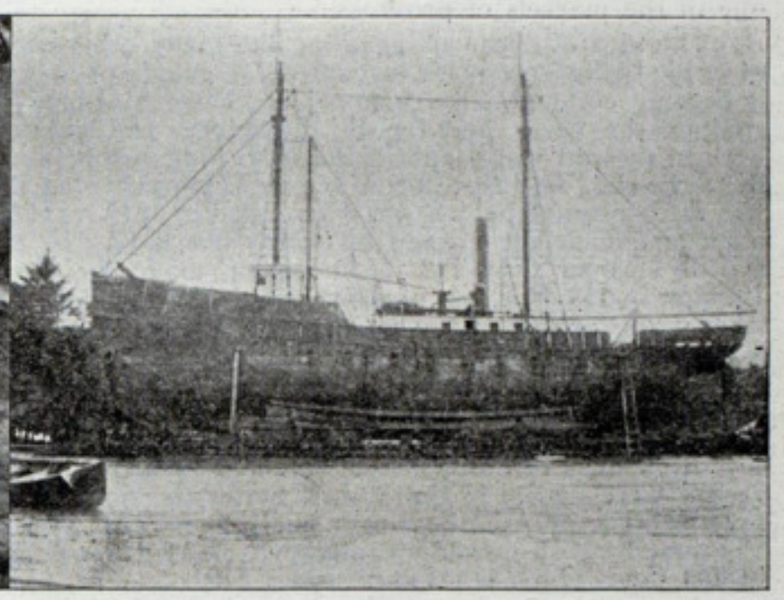
"Neither at the Cramp works nor at the Camden works is any joggling of shell plates resorted to, speaking, that is, of work now in hand. At the former works some bulkhead plates and other minor portions are joggled, but not the heavier work. Hydraulic plant appears less effectively employed than at home. The writer saw little hydraulic riveting, and such hydraulic punches and presses as are in use seem to have the four supporting columns, instead of being open in front, as in the best modern machines. In the plate edge planers at the Cramp works the plates are held to their work by hand clamps, instead of by hydraulic presses. In the Camden works less flanging is resorted to than at home, but this is, perhaps, because things are not fully organized. Certainly at Chicago flanging is used quite as effectively as in Britain.

"The impression borne upon the writer from his somewhat hasty visits was that a judicious selection of American methods is well worth the most careful attention of the British ship builder. The American, on the other hand, has something to learn from the methodical equipment of an up-to-date yard in the old country, both in the relative positions of and space allotted to ships' bending blocks and sheds, and also to the provision of machine tools of ample capacity for work now common."



OVERLAND.

PART OF CRADLE.



LAUNCHING IN BAKER'S BAY—WORK AT LOW TIDE.

MASONRY DRY DOCK AT HUNTER'S POINT.

Considerable progress is being made upon the new masonry dock which the San Francisco Dry Dock Co. is building upon a site adjoining its old dock at Hunter's point. The old dock is 498 ft. long and 90 ft. wide at entrance. The new dock is 750 ft. long from the gate seat with a width of coping of 122 ft., and at bottom 74 ft., having a depth over sill of 30 ft. at high water, making it one of the largest and commodious graving docks in the world. At the entrance to the dock on either side are located wharf approaches, 60 ft. wide and 200 ft. long. Both docks are connected by a tunnel under pump pit, and the pumping plant is capable of emptying the new dock at high water in two hours and the old dock in forty-five minutes. This means a solid stream of water 8 ft. in diameter with a velocity of 500 ft. per minute. The engine house is virtually completed; pumping engines are on the ground, and well advanced in course of erection. The large 8-ft. gates are in place; the tunnels into both docks are completed. The pumps are on the ground, and four out of six are in place. The centrifugal pumps, three in number, lack but ten days of completion, and would have been ready some thirty days ago but for the machinists' strike. The cofferdam at the entrance is in course of construction, and one-fourth of the excavation of the dock proper has been made. The chimney over the engine house is a handsome stack of unusually graceful proportions. It is cylindrical in form, and will be the landmark for all vessels passing up and down the bay; it is 110 ft. high and 12 ft. in diameter, being 60 ft. higher than the stack which was used for the old engine house. The engine house will be fitted throughout with natural Oregon pine, and is most complete in all details. The work on the caisson, or gate, for the dock is commenced.

Percy & Small, Bath, Me., have stretched a keel for a four-masted wooden schooner for Capt. Sidney G. Hupper of Rockland, Me. The vessel will be launched about Dec. 1.

The steamer Olympic for the E. K. Wood Lumber Co. is nearing completion at George W. Hitchings yard, Hoquiam, Wash.

A BRIEF HISTORY OF OCEAN PASSENGER SHIPS.

BY LAWRENCE IRWELL.

It is the general opinion of marine engineers that the present speed of the ocean greyhound will not be materially increased by the present method of propulsion. The prevailing type of engines has about reached its highest efficiency commercially considered. The ratio of cost to speed beyond the present limit is absolutely prohibitive. The Deutschland, therefore, logging at 24 knots per hour—for that is what she recently did on the southerly course—represents the practical maximum. The Deutschland's fastest trip to Plymouth was five days, seven hours and five minutes, but this was on the northerly course. The Kaiser Wilhelm II, now building for the rival North German Lloyd line, may add a fraction of a knot to this speed, but it will not materially alter the total. The type has apparently reached its limit. Any material advancement of speed must come through some radical departure in the employment of steam. The tendency of the time is towards the construction of vessels of moderate speed and great carrying capacity. The Campania, Lucania, Kaiser Wilhelm der Grosse and the Deutschland are the highest types of racers. Each of them can make over 22 knots. The Oceanic was the first to represent the new tendency. She is reasonably fast, logging 20 knots, but is commodious. The Celtic, which sailed for New York on Friday last, is the largest vessel ever constructed in the world and is the latest and best evidence of the new idea. She is a 17-knot vessel, but her cargo capacity is immense. Indeed she can house and feed the population of a city and carry besides an immense quantity of cargo. The ocean liner has been so developed that its schedule is adhered to with the accuracy of a railway train. The elements make no difference. Summer and winter, through heat and cold, through the worst weather imaginable, the steamship keeps her time. The old Etruria of the Cunard line has encountered gales of inconceivable fury and yet has never varied one hour from her schedule. The submission of the ocean to the mind of man is one of the marvels of progress.

The idea of ocean navigation, like many other modern developments of engineering enterprise, occupied the minds of men many years before it became commercially practicable. River steamers ploughed the Mississippi, the Clyde and the St. Lawrence, and coasting steamers "ran" both in the old world and in the new, long before any ventured to cross the Atlantic. The first steam vessel which achieved this memorable feat was the Savannah, which was dispatched in 1819 from Savannah to Liverpool, and made the voyage in twenty-five days. In 1825 the Enterprise, a little steamer only 122 ft. in length, made the trip from Calcutta to London in 113 days, ten of which were spent in stoppages. In 1833, fourteen years after the Savannah's voyage, a second vessel, the Royal William, crossed the Atlantic, this time from Quebec to London, in about forty days. Not until 1838 did the first passenger steamer make an outward trip from Liverpool to New York. She was followed in the same year by the Liverpool, which made several passages, averaging seventeen days out and fifteen on the return trip to England. As these vessels were owned in the United States the honor of demonstrating the practicability of Atlantic steam navigation rests with the great republic. The first English-owned steamer that crossed the Atlantic was the Sirius of 703 tons, which left Queenstown April 5, 1838, for New York, arriving there 18½ days later. The famous Great Western left Bristol, England, on the 8th of the same month, and reached New York on April 23, a few hours after the Sirius.

FIRST LOOKED UPON AS CHIMERICAL.

The achievements of these vessels demonstrated beyond doubt the practicability of ocean steam navigation. Their performances elicited quite as much interest and wonder then as do the feats of the latest "flyers" of today. Yet during the year 1838, in which the steamships commenced their careers, Dr. Dionysius Lardner, a competent English physicist, said at the Royal Institution at Liverpool that "the project which is announced in the newspapers of making a voyage directly from New York to Liverpool is perfectly chimerical, and we might as well talk of making a voyage from New York to the moon." Even after the practicability of ocean navigation had been demonstrated, its commercial success was not assured. The clipper ships were to the pioneer steamships what the stage coaches had been to the early railways. One of these clippers, the Great Republic, of course an American, a four-master of 3,400 tons, once covered the distance between New York and the Scilly isles in thirteen days. Some few of the sailing clippers actually raced the early steam vessels leaving port with and arriving before them. In 1846 a sailing clipper—the Tornado of the Niagara line—arrived in New York before a Cunard steamer which had started with her reached Boston. The performances of American clippers and the splendid traditions in the art of ship building may perhaps to some slight extent explain the successive victories of American yachts in the competition for the international cup. But although fast sailing ships strove very hard to hold their own against their unpopular rivals, the contest was unequal, for while the clippers embodied the last and highest efforts of the ship builders, the steamships—contemporaries—were but the crude first fruits of the labors of the marine engineer.

The greatest public interest has always followed the development of the Atlantic passenger vessels. Competition on this crowded highway has been keener than on the less frequented routes, and the ships that travel over it have naturally led the van of progress. There are, as yet, no steamers in the world so huge as those which cross the Atlantic; no engines so powerful; no floating populations so great. These vessels are the monarchs of the sea, and the history of their growth is typical of that of the great ocean ships all the world over. It is desirable, therefore, first to epitomize the story of the Atlantic service, the commercial success of which was largely due to the late Mr. Samuel Cunard, who had long cherished a dream of making ocean travel as regular as that by rail. Mr. Cunard was a Quaker, residing at Halifax, N. S., and had indulged this idea for some years before the date when the voyages of the Sirius and Great Western, though commercially unsuccessful, had demonstrated the possibility of ocean steam navigation. When in 1839 the British admiralty issued circulars inviting tenders for a steamship mail service, Mr. Cunard, who had already acquired considerable experience in carrying mail between Boston, Newfoundland and Bermuda, determined to undertake the contract. Through the influence of Mr. Burns, a shipping merchant, and others in Glasgow and Liverpool, a capital of £270,000 was subscribed, and a seven-years' contract with the admiralty was secured, stipulating for a fortnightly service between Liverpool and Halifax and Boston, at a subsidy of £60,000 per annum. From that year (1839) dates the beginning of the Atlantic steam mail service and of the Cunard line.

BEGINNING OF THE ATLANTIC STEAM MAIL SERVICE.

Four steamers were built by Mr. Cunard's company. The first of these, the Britannia, was launched on Feb. 5, 1840, and sailed for the United States on July 4, a Friday; and although this day is looked upon by sailors as an unlucky one, yet it proved far otherwise in the case of this ship and of the company of which she was the pioneer. The advent of these steamships was a remarkable event in the history of the Atlantic, and one of international interest. When Mr. Cunard arrived at Boston on the Britannia he received within twenty-four hours over 1,800 invitations to dinner. When in the winter of 1844 the vessel was frozen up in Boston harbor, the citizens went to the enormous labor and expense of cutting her out, so that the mails might not be delayed. Although this involved cutting a canal through seven miles of ice, ranging from 2 to 6 ft. in thickness, at a cost of $20,000, the people of Boston refused to be reimbursed by the United States mail department. These early Cunarders were built of wood and propelled by paddles, and they carried first-class passengers only, of whom 115 could be accommodated, though there were seldom as many as 100 on board on a trip. Poor Irish emigrants, and also many people of moderate means, were compelled to travel by sailing clippers, because the steamship fares—30 to 35 guineas (about $155 to $180)—were as high as they now are on some of the finest "greyhounds" in the service. The time occupied by the passages varied much more widely than it does at present. The average was about fourteen days, or one-half that generally occupied by the sailing vessels. Some trips were made even then in eleven days and a few hours, while others occupied sixteen and seventeen days.

The early vessels of the Cunard line maintained a steady lead, which has never been permanently lost by the company during the sixty years of its history. Year by year additions were made to its fleet, with increase in capacity and power, but with the rentention nevertheless for a long time of the old models—the wooden hulls, the paddles, and Napier's famous side lever engines. The initiative of 1840 was a bold one, but when success seemed assured rivals entered into the field. The proprietors of the Great Western built Brunel's Great Britain, a vessel which but for an accident might have proved a formidable competitor. She was much longer and more powerful than any other steamer then afloat, being 322 ft. long and of 3,270 tons, was constructed of iron, eleven years before that material was adopted by the Cunard company, and was the first vessel of that class fitted with a screw. But like the Great Eastern subsequently she was born before her time. Placed on the Atlantic service in 1845, she ended her connection with it fourteen months later by being wrecked in Dundrum bay on the Irish coast. Floated eleven months later, she had a chequered career, and was not long ago still in service—as a coal hulk. With her accident all serious competition from the port of Bristol ceased.

The first great rivalry with the Cunarders came from an American company—the Collins line—which began its career in 1849. Then followed for a few years a race of giants. Advantage had been taken in building the Collins' vessels of the experience of their rivals. The company was, in addition, subsidized by congress. Their ships gained a speed over the Cunarders by a few hours on the voyage, and in addition freights were cut down by nearly one-half. The American company lost heavily in its attempt to regain the prestige which had been wrested by steam from the clippers, for the Cunard company having a strong financial position, soon built more powerful vessels—the Arabia and the Persia—the latter bringing the passage down to between nine and ten days. At last, in 1858, the unequal contest came to an end through the withdrawal of the Collins line. Besides having sunk large sums of money, this company had unfortunately lost two vessels—the Arctic, which was run down by the Vesta in 1854, with terrible loss of life; and the Pacific, of which nothing was ever heard after she sailed from Liverpool on June 29, 1856, with 240 persons on board. From these losses and disasters the company never recovered, and their rivals retained their leading position in the Atlantic trade. The Collins company left one permanent legacy—the barber's shop—which was unknown on Atlantic liners until introduced on their vessels.

INMAN LINE SERVICE ON THE ATLANTIC.

In 1850, some time before the disappearance of this ill-fated company, the Inman line—now the International Navigation Co.—commenced its career. It is curious that, although a regular Atlantic steam service had then existed for ten years, Mr. Inman was the first to perceive the advantage of an emigrant service from Great Britain to the United States, and his ships were the first which were built to accommodate second-class and steerage passengers, for whom no provision had previously been made by any other line. The experiment proved so remunerative that, three years later, it was followed by the Cunard company. At the present time all Atlantic liners, with a very few exceptions, carry more emigrants from Europe to the United States than saloon passengers. Iron as a building material, and the screw in the place of paddles, were also first successfully employed on the Atlantic by the Inman company, for the unfortunate Great Britain, it must be remembered, had fallen early out of the running. Steam steering gear was first adopted by the Inman company on the City of Brussels in 1869, and this also was the first vessel which reduced the Atlantic voyage to less than eight days.

The Inman proved a more formidable rival to the Cunard steamers than the Collins line had been. But the rivalry between the Cunard and Inman vessels was never so bitter as that with the Collins company, and there was—as we now know—plenty of room for each concern, in view of the rapidly increasing volume of Atlantic trade. The ocean "tramps," designed solely for slow transit of freight, now became greatly developed in capacity; and as a result of their competition for freights, the passenger

carrying companies turned their attention more and more to the improvement of that branch of the business.

To the rivalry between the Cunard and Inman lines was added in 1871 that of the Oceanic Navigation Co., better known as the White Star line. The appearance of this company marked an important epoch in the Atlantic service. The first Oceanic, though not so large as some of her rivals, was differently modeled, being narrower in proportion to length, a feature which, though in opposition to the practice of the period, has since been adhered to. The saloon for the first time was placed amidships, instead of astern over the screw, an arrangement most conducive to the comfort of the passengers. It extended also right across the entire width of the vessel. The staterooms were placed fore-and-aft of the saloon, and the side-lights were made twice as large as upon previous vessels. In 1874 and 1875 the Germanic and the Britannic of the same fleet followed and reduced the passage to less than 7½ days. The Teutonic and Majestic (1891) were the largest steamers built for this line until the present Oceanic made her appearance a few years since. The new giant, the second Celtic, is about to appear in New York harbor. She is not built for speed. The Teutonic and Majestic were the first ships designed to fulfil the requirements of the British admiralty for armed cruisers. The most rapid development of the Atlantic service dates from the period when the White Star vessels entered the lists. In 1870 the Cunard company first fitted one of its vessels—the Parthia—with compound engines. In 1881 came the Servia, which commenced the express transatlantic service, intended chiefly for passengers. She was the first steel vessel in the Liverpool and New York trade. The electric light was not introduced till 1879, when the Inman company's City of Berlin was fitted with the necessary apparatus. The Arizona of the Guion line was a noteworthy vessel, eclipsing previous records in 1879 and 1880. But her best advertisement was the fact of her running full tilt into an iceberg in November, 1879, and yet coming safely into port, with 30 ft. of her bows smashed in, her water tight bulkheads having proved her salvation.

WORKING DOWN TO SIX DAY TRIPS.

The decade from 1879 to 1889 was a time of great emulation. The Alaska of the Guion fleet, starting her career in 1882, was the first vessel that reduced the voyage below seven days—in June of that year; and she was the first ship to which the title "Atlantic greyhound" was applied. The Oregon, bought from the Guion line afterwards by the Cunard company, reduced the passage in 1880 to less than 6½ days. Following the Arizona and the Alaska came the America of the National line and the famous Cunarders Etruria and Umbria. The Inman line owned the first vessel which crossed the Atlantic in less than six days, the feat being accomplished in 1889 by the City of Paris. The only important advance upon this record has been made by the North German Lloyd steamer Deutschland, to which reference has already been made. The City of Paris and her sister, the City of New York, marked a great advance on previous designs. Twin screws were introduced, each driven by its own set of engines. Water tight compartments were more minutely subdivided. Water chambers were introduced and breadth of beam was increased to diminish rolling. This change has, however, given place to bilge keels. The rudder was placed entirely below the water line. It was on the Paris in 1890 that the value of the water tight bulkheads was abundantly demonstrated. One of the engines became completely wrecked and caused the water to flow into and fill both engine rooms—an absolutely unique experience of the sea. Yet the ship remained afloat till help came. How the water tight compartments again saved the Paris from total wreck on the Manacles (south coast of England) will be fresh in everybody's memory. This steamer is now being rebuilt at Belfast, Ireland, and will in future be known as the Philadelphia.

The past decade has been one of steady good work, without any astonishing advance. Its chief developments have been not so much in increased speed as in greater comfort and additional carrying capacity. Several of the older seven and eight day steamers are still in the service, and as their rates are usually lower than those of the big new ships, they are favorites with many travelers, who have no objection to prolonging a pleasant voyage. One of these older steamers is the Germanic, which sank at her moorings in New York harbor early in 1899, owing to the weight of ice upon her. This ship has now made more than 500 trips across the Atlantic. She and her sister ship, the Britannic, built in 1874, have each traveled considerably over 2,000,000 miles. Between them they have carried more than 100,000 saloon and 260,000 steerage passengers across the Atlantic.

As has already been intimated, the chief additions of the past ten years have been the Campania and Lucania, the Teutonic and Majestic, the Kaiser Wilhelm der Grosse and her sister ships, the Deutschland and the Oceanic. The last named was, prior to the launch of the Celtic some months since, a "record" vessel, not on account of her speed, which does not exceed that of vessels previously in the service, but because of her dimensions, capacity and splendid accommodations, some account of which will be given later. In an age in which business and profits have been so often dragged and soiled in the mire of dishonesty, it is pleasant to be able to write that all the White Star steamers have been built by Harland & Wolff at Belfast, Ireland, to the order of Ismay, Imrie & Co., without a legal contract. The late Sir Edward Harland once said in an after-dinner speech, especially in relation to the Teutonic: "My firm has been put not upon its metal but upon its honor, for we received absolute carte blanche as to cost." It may not be out of place here to offer a word of warning to steel manufacturers. Nobody doubts the excellence of American steel; but it is not always uniform in quality, and a firm of Belfast shipbuilders were last year compelled to reject a quantity because it was not up to the standard required by the contract. The managers of steel plants might do well to keep this incident in mind.*

Until about ten years ago little attempt had been made in Germany to rival the British-built steamships. But during this period the North German Lloyd Steamship Co. and the Hamburg-American line have been building their large vessels chiefly in German yards. The first named company has built during the past nine years more than two dozen first-class steamships and has now about a dozen more in course of construction. Before the launch of the Oceanic, the honor of having the largest vessel afloat was held by Germany. The Kaiser Wilhelm was built at Stettin, and made her first trip from Bremen to New York in 1897. She is 625 ft. long—23 ft. longer than the Campania—and only 60 ft. less in length than the Oceanic, which is 5 ft. longer than the Great Eastern was. The Deutschland is somewhat smaller than the Oceanic, being 45 ft. shorter, 1 ft. less in width, nearly 9 ft. less in depth, the difference in gross tonnage being about 770 tons.

The North German Lloyd Co. has five distinct services between Europe and America—two between Bremen and New York, calling at Southampton; one between Bremen and Baltimore; another between Bremen and Galveston, Texas; and still another between New York and Genoa, touching at Gibraltar and Naples. This last route, one of the newest, is also one of the most popular with Americans, for many people like to enter Europe from the south, visit the continental cities, and return home by the same line of steamships from Bremen or Southampton.

The Hamburg-American line, with its fleet of seventy-five steamers, covers the whole of the North and South American routes from Hamburg and Southampton to New York, Mexico and Brazil. The vessels of this line are the equals of any in existence, as all passengers upon them will testify. The company is, in addition, financially prosperous, and has lately bought from the estate of the late Sir Arthur Forwood the Atlas line, which runs from New York to the island of Jamaica. It is true that there is now no British line of steamships upon this route, but it is also true that Elder, Dempster & Co. have established a direct service between England and Kingston, Jamaica, the objects of which are to land tropical fruit in Great Britain in prime condition and to develop Jamaica as a health resort. For purely English purposes no steamers between the last named isle and the United States are urgently needed.

OTHER OCEAN HIGHWAYS.

The story of the North Atlantic lines need not be pursued further. The history of their development would be chiefly a recapitulation of that of the great pioneers. The initiative of the Atlantic has been followed upon all the routes of the globe, and the rivalries of the steamship companies have contributed to make one passenger vessel very much like others in respect of equipment and the safety and comfort of the passengers. We now therefore leave the North Atlantic to course rapidly over the other ocean highways. After the Atlantic the most crowded ocean routes are those which lead to and ramify in the east. These seas, not so long since the haunts of pirates, are ploughed by the keels of a dozen large steamship lines, and the crowded harbors and busy seaport towns, from Colombo, Ceylon, to Yokohama, Japan, almost rival those of Europe and America.

A great line, which had its origin in the days of sailing craft, is the Peninsular & Oriental. To many Englishmen its services are associated with the memories of a long life passed in the tropics. For more than half a century, since the palmy days of the clippers, it has been the chief means of communication between Great Britain and the east. The history of this fleet began in 1825; the present company commenced its career in 1836 and was incorporated in 1840. It now owns sixty vessels, the largest of which registers close upon 8,000 tons. The ships make voyages between London, India, the far east and Australia. The mail contracts are 16½ days to Bombay, 37½ to Shanghai, and 35½ to Australian ports. Seldom are the mails even an hour late—they are usually in advance of contract time. The Caledonia has landed letters in Bombay, India, within 12¼ days from London. These ships touch at the Indian ports, at those of the Malay peninsula, at Hong Kong, at the Japanese ports as far north as Yokohama, and at some Australian cities. Twelve P. & O. steamers at least are retained by the British admiralty as armed cruisers, but the total payment for this service is small, being below $40,000 per annum. In the past twenty years this company has spent over $35,000,000 on its fleet and accessories. It is the oldest but one of the great British steamship companies, and its vitality remains unimpaired by its long career of success.

Few persons who are not in business connection with the Orient know that one of the largest and best shipping lines in the world is owned by Japan, and manned chiefly by Japanese. This corporation—the Japan Mail Steamship Co. (Nippon Yusen Kaisha)—has wonderfully developed from half a dozen small vessels, owned some thirty years ago by a feudal chief. At present it comprises a fleet of sixty-seven steamers, besides about a dozen in course of construction. At first and for many years it maintained a merely local service, but now its vessels steam between Antwerp, Belgium, London, England, and the east via Suez, calling at numerous intermediate ports. They cross from Yokohama to Seattle. In addition, there is an Australian service, as well as one for islands in the South seas, and another for the Malay archipelago. The story of the rapid expansion of this line, since the establishment of the present company in 1885, is like a romance, harmonizing well with the remarkable development of Japan in other respects.

LARGEST FLEET IN EASTERN WATERS.

The largest fleet of vessels in eastern waters is that of the joint British India Steam Navigation Co. and the British India Association Steamers Co. Their vessels, the names of all of which terminate in "a," number over 100, but they are mostly of less than 6,000 tons. There is scarcely an eastern port, however obscure, at which some of the vessels of this fleet do not call; and the vast spaces of the ocean area from London to Singapore and Australia are covered by the operations of over twenty distinct services of steamships. They are ubiquitous in the Mediterranean and the Red sea; they may be found down the east coast of Africa, as far south as Delagoa bay, and far up the Persian gulf; they steam around India from Kurrachee to Calcutta, to the Burnese ports, to Java and Australia. Many obscure Arabian and East India sea ports are places of call for these steamers—towns which possess as yet no harbor, where the anchorage is often miles from the shore, and where on landing there are no hotels to welcome the traveler.

The French line, the great Messageries Maritimes de France, is to France and Southern Europe what the Peninsular & Oriental is to Great Britain. Its headquarters are at Marseilles, whence its vessels sail for the east, Australasia and South America. The company owns about sixty steamships, which are grouped and allotted for the various services. In the Mediterranean and the Black sea alone they employ eighteen ships. The Messageries steamers to the east all go through the Suez canal. They

*A desire to effect prompt delivery caused the American manufacturers to ship the steel before Lloyd's inspector could examine it. This irregularity caused its rejection. The sample of the consignment, left for inspection, was later found to be flawless.—Editor.

do not touch the West or South African ports; but a separate Indian ocean service includes Madagascar and the East African ports as far south as Natal.

The North German Lloyd Co. has a mail service between Bremen, China, Japan and Australia, calling at Naples

The Austrian Lloyd vessels "run" between Trieste and Bombay, through the Suez canal.

The steamships of the Italian General Navigation Co. (United Florio & Rubattino Companies) also take the Suez route from Genoa and Naples to Bombay.

The name of Suez occurs frequently in the story of ocean liners. The opening of the canal in 1869 has so greatly diverted the traffic to the east that the proportion of voyages through the canal to those around the Cape is now about as 105 to 60. The duration of the journey to India is, by this change, shortened by about one-third. Since 1886 the canal has been opened for night passages to steamers equipped with electric light. In 1871 the total number of ships which went through the canal was 765, their net tonnage being 761,467 tons; in 1897 the number of ships had increased to 2,986, and the net tonnage to 7,899,373. In 1875, 84,446 passengers traveled by the canal; in 1897, 191,215. Although the ships of all nations are to be seen at Suez, British vessels, of course, predominate, contributing 70 per cent of the tolls, in spite of a reduction for the time—being as a result of the war in South Africa.

CHOICE OF ROUTES TO THE FAR EAST.

Within living memory the only desirable route to the far east was that which went eastwards, the alternative being the western voyage around the horn—a terror to sailing craft. But now there is choice of several western routes across this continent, and these absorb a large and increasing volume of the trade. Some of the greatest of the mammoth railroads have become linked with the orient by fleets of steamers. One of these is the Northern Pacific and Union Pacific, the route of which passes through Utah to San Francisco, from which city there is a choice of steamers to Asia. The Great Northern railroad also is about to start giant ships in the China and Japan service with every prospect of success.

The Canadian Pacific railway is the "all British" route. It stretches for 2,900 miles across the continent from Halifax, N. S., to Vancouver, B. C. This railroad owns the three vessels of the Empress line, which cross every three weeks between Vancouver and the ports of China and Japan, carrying those European mails which go to the east through Canada. By the Empress line one may travel the 10,038 miles which separate Hong Kong from Liverpool with only two changes. There is choice of a dozen lines of steamers across the Atlantic by which the traveler can land at New York or at a Canadian port. About eight days will cover the 2,830 miles from Liverpool to Montreal and five days the 2,905 miles of Canadian Pacific railway between Montreal and Vancouver. Fourteen days are required for the 4,300 miles of ocean between Vancouver and Yokohama. Thus, twenty-seven days only separate England and Japan.

The ocean voyage of 4,300 miles between Vancouver and Yokohama crosses the 180th meridian about midway in the ocean, and "antipodes day" is said to mark the highest northward position of the ships in the great curve which they describe from port to port. Nowhere is the loneliness of the ocean more evident than in the vast Pacific. There are very few passing sails; no icebergs break the monotony of the voyage. The only excitement is derived from the chance of a typhoon in August or September, but no storm on the sea endangers the big ships. Life on these steamers is marked by strong contrast with that on the Atlantic vessels. The influence of the orient is felt. The passengers are usually eastern merchants, old travelers who are familiar with the trip, and who take life leisurely; wealthy Japanese and Chinese, and also dealers in tea, silks and opium; pearl merchants and teak dealers. In addition, planters from Siam, Java and the East Indian archipelago are fairly numerous. Missionaries and the representatives of the great European commercial houses are, of course, very much in evidence. Lastly, "globe trotters" in search of health, amusement or knowledge, are generally present, and the much-traveled folks are in the habit of regarding them with good-humored toleration. The waiters upon these ships are Chinamen, who wear blue blouses and caps; they glide about silently, and answer to the call of "boy" or the clapping of hands. Lunch in the middle of the day is known as "tiffin." All this savors of the somewhat slow east, but the west asserts itself on the mechanical side. Electric fans cool the air, the electric light is present in abundance, and the highest resources of scientific engineering wait on the safety of the ship and the comfort of the passengers.

What is known as "Asiatic steerage" is a separate class on the Pacific steamers, being retained exclusively for Chinese, Japanese and such other persons as indulge in opium smoking; it is open to men only. The bones of Chinese who have died in this country or in Canada are often a part of ship's cargo, and if a Chinaman should die aboard it is stipulated that he shall not be buried at sea, but shall be embalmed and taken to his own land.

(To be continued.)

TYPE OF SHALLOW DRAUGHT GUNBOAT.

Messrs. Yarrow & Co. of Poplar, England, have just constructed for the British admiralty two shallow draught gunboats of a type adapted for the navigation of crooked and shallow rivers—a type such as the United States government will later need for the Philippines. As the vessels are distinct from anything afloat considerable interest is manifested in them. These vessels are named the Teal and the Moorhen. They are each 160 ft. long and 24 ft. 6 in. wide. The hull is composed entirely of galvanized steel, and is subdivided into twelve water-tight compartments. The main deck is of steel, and is covered with corticene. The upper deck, or battery deck, extends for about half the length of the vessel. Above this is the awning deck, from which are swung the hammocks for the accommodation of the troops. Protection is afforded at the sides of the vessel by chrome steel plates, by Messrs. Cammell & Co. These are of sufficient thickness to resist rifle-fire point-blank at close quarters. This armor protects the machinery and cabins; chrome steel plates form the bulwarks round the battery deck. Forward, on the battery deck, there is a conning tower, which is also rifle-proof.

The duty for which these vessels were designed was to obtain a speed of 13 knots, equivalent to about 15 statute miles an hour, when carrying a load of 40 tons on a draught not exceeding 2 ft. 3 in. All the machinery and fighting spaces were to be protected by rifle-proof plating, and the fuel to be used was wood only. The system of propulsion adopted by Messrs. Yarrow in this case was that of twin screws, revolving in tunnels of a special design. There are two sets of compound surface-condensing engines with a speed of about 300 revolutions per minute. There are two Yarrow water tube boilers, of the usual straight tube type made by this firm.

The space available in these little vessels has been skilfully utilized for the accommodation of officers and crew. The former are berthed in well-fitted cabins between the main and battery decks; the armor protection being loopholed for rifle fire. Forward, there is a cabin divided to form a ward-room and commander's cabin; this is fitted for three officers. Aft of this there is a cabin which will accommodate eight petty officers. The arrangements for the crew are made for natives, and there is a specially-fitted sick bay. The magazines are placed below, ammunition hoists passing through the cabins, so that there is direct communication, under cover and protected from shot by the cabin plating, between the magazine and the battery deck.

The vessels have square sterns, and in order to insure quick maneuvering powers—very necessary when navigating crooked rivers, often full of shallows—there are four rudders, which can be actuated either by steam or hand gear. There is a fan in the stokehold, for forced-draft purposes. This was not in operation during the official trial, to which reference will be presently made, but is intended to be used under exceptional circumstances, when only wood of an inferior character is available for fuel.

It will be seen, from what has been said, that Messrs. Yarrow, in accepting this contract, had a somewhat difficult problem to solve before attaining success. The firm has had, however, considerable experience in steamers of this class, and for many years past has been remarkebly successful in securing high speed on very light draught, with vessels built in floatable sections for easy transport. The latter system of construction was introduced by Messrs. Yarrow & Co. about eighteen years ago, by means of a stern wheeler, Le Stanley, built to the order of the king of the Belgians for the exploration of the Congo river. The floatable section system offers notable advantages in vessels intended for new countries, as it obviates the old method of sending the hull out in parts, to be riveted up where skilled labor is nearly sure to be difficult to obtain, and where launching may be a tedious and prolonged operation. By placing the twin screws in tunnels of a special design, a large diameter of propeller is made possible, without the tips of the blades passing as they revolve below the bottom of the hull; and thus the screws are not liable to be damaged if the boat runs on to a sand bank. Moreover, they can be brought nearer the surface of the water without losing efficiency by drawing down air; and, indeed, the result of the trial shows a good propulsive result. With this system, too, the propellers are very accessible. Doors are placed at the crown of the tunnels, which rise above the level of the surrounding water, and by removing these the screws can be examined or removed without difficulty, while the vessel is afloat. The advantage of carrying out these operations without docking the boat or putting her ashore will be apparent, specially in a new country.

It will be remembered that two shallow-draught gunboats, the Shiekh and the Sultan, were built about four years ago to the order of the Egyptian government for service on the Nile, where they played an important part in the operations against Khartoum. The Teal was launched recently with steam up, and at once made a run down the Thames for a preliminary trial. A few days later the official trial was made.

From the naval architect's point of view, the trials are exceedingly interesting. The high speed and light draught, the considerable load of 40 tons, and the large area protected against rifle fire, are all matters of great importance. From the engineering point of view, also, the performance of the boiler is worthy of attention, and shows how well the Yarrow class of steam generator can be operated without forced draft. It is not only to the designer of warlike craft that these clever boats will appeal. They are, perhaps, of even more interest to trades engaged in opening up new markets for British manufacturers in distant lands.

INGENIOUS LIFE SAVING APPARATUS.

Mr. W. Shermuly of Poplar, England, has invented a life saving apparatus of more than ordinary utility. It is a combination line box and rocket stand which it is proposed should be carried on ships of all kinds. It is clear that in nine cases out of ten ships are wrecked by being driven on a lee shore, and all attempts to throw a line to them from the land will be more or less violently opposed by the wind. If, on the contrary, the rocket is discharged from the ship it will be helped by the wind, and the line is certain to reach the shore. Obvious as all this is, it seems to be certain that vessels do not carry rocket rescue apparatus.

The Shermuly apparatus is very simple. The line, 400 yards long, with a breaking strain of 554 lbs., in superposed layers, is coiled around specially arranged pins, and forms a compact mass contained in a box 16 in. by 16 in. by 6 in. Upon the box is a support for the rocket holder, which latter is mounted on a stem or standard with a ball-and-socket connection, permitting adjustment to, and clamping at, any angles of elevation and deflection—the whole forming a self-contained, rigid combination for a stationary or steady platform, with an important provision for maintaining the proper elevation when the ship is rolling. The rocket holder may be clamped to the deck rail or bridge rail. Easily carried by one man, the complete apparatus may be taken aloft or other part of the ship, and the rocket fired thence. It can be conveniently stowed in the bridge wheelhouse.

A British admiralty chart, Midland section of Georgian bay, will be sent, postpaid, to any address for $1.25; regular price $1.75. Size of sheet 3x4 ft. The Marine Review Pub. Co., Perry-Payne building, Cleveland. Chart of the whole bay on one sheet at the same price.

The Marine Iron Works, station A, Chicago, have just issued a new 48-page catalogue descriptive of their product, which they will send free on receipt of request. A separate pamphlet issued by the same company, devoted especially to "River Navigation" (shallow water stern wheel boats), will also be included if asked for.

THE SCHLEY COURT OF INQUIRY.

The court of inquiry to investigate the conduct of Rear Admiral Schley will consist of Admiral Dewey, Rear Admiral Lewis Ashfield Kimberly, retired, and Rear Admiral Andrew Ellicot Kennedy Benham, retired. Rear Admiral Kimberly has asked to be excused, but the secretary of the navy has not as yet excused him. Admiral Dewey is too well known to require space for introduction, but possibly a little about the other two might not be amiss. Rear Admiral Kimberly was retired for age on April 2, 1892, and is now seventy-one years old. Rear Admiral Benham was retired on April 10, 1894, and is now sixty-nine years old. They have splendid records. Admiral Kimberly lives in West Newton, Mass., and Admiral Benham in Washington. It was Admiral Kimberly who was sent to Samoa in 1889 in command of a squadron to protect American interests. The friction between the American and German ships was very great and there was danger of a clash, but confidence was felt in Washington in Kimberly's ability to proceed diplomatically, or, if necessary to defend the honor of the flag. The great hurricane of March, 1889, relieved the situation. Both American and German ships were destroyed. Admiral Kimberly was born in Troy, N. Y., in 1830. In the civil war he served as executive officer of Admiral Farragut's famous flagship, the Hartford, and participated in many important actions, including that of Mobile bay. Admiral Dewey was a junior officer of the Hartford with Admiral Farragut at the time. In the Corean expedition Admiral Kimberly commanded the landing force that captured the Chemulpo forts.

Admiral Benham is best known as the man who broke the blockade at Rio de Janeiro in the Brazilian rebellion of 1895, and not only enabled American merchantmen to discharge their cargoes but gave the death blow to the attempt to re-establish the Portuguese monarchy in Brazil. Benham made fruitless efforts, through diplomatic means, to secure permission from the rebels, who controlled the navy of the republic, for some American vessels laden with flour to discharge their cargoes at the Rio wharves. Finally he served notice on the rebel admiral, de Gama, that he intended to convoy the flour vessels to the city. The little second-class cruiser Detroit, under Commander Willard H. Brownson, now of the battleship Alabama, started by Benham's orders to escort two American merchantmen through the blockade line. Two rebel battleships with shotted guns and their crews at quarters barred the way. One of them fired a shot across the bow of the Detroit and Brownson responded with a shell aimed at the hull of the Brazilian and shouted over the side that he would sink her if another shot were fired. This ended the incident and the revolution. De Gama attempted to surrender to Benham, but the latter refused to regard him as an enemy. The blockade was completely broken and the attempted restoration of the monarchy went to pieces. Admiral Benham was born in New York city in 1832, entered the navy in 1847 and two years later participated in the capture of a piratical Chinese junk near Macao, receiving a slight pike wound in the right thigh. He was lieutenant-commander in the civil war, serving principally on the blockade of the Texas coast.

LAUNCH OF NEW BATTLESHIP MAINE.

The new battleship Maine was launched successfully at Cramps, Philadelphia, last Saturday. A great crowd saw the battleship take her first plunge in the waters of the Delaware. The big hull was let go just as the tide slackened and she glided down the ways without a hitch. Capt. Sigsbee, who commanded the old Maine when she was blown up in Havana harbor, was present. Miss Mary Preble Anderson of Portland, Me., a descendant of Commodore Preble of the United States navy, christened the vessel. The date of the act authorizing the building of the new Maine was May 4, 1898. The contract was signed on Oct. 1 of the same year, and the first keel plates were laid on Feb. 15, 1899. Under the contract she was to have been completed on June 1 of this year, but the controversy over armor delayed her construction and an extension of time was granted.

The Maine represents another step in the development of the battleship. In her construction the omission of wood has been carried to a greater extent than in the older ships. Whatever wood is used is fireproof, except the Georgia pine planks on the weather deck. The principal dimensions of the ship are: Length between perpendiculars, 388 ft.; length over all, 393 ft. 10½ in.; extreme breadth, 72 ft. 2½ in.; mean draught, 23 ft. 6 in.; displacement, 12,300 tons; full load displacement, estimated, 13,500 tons. Her armament will consist of four 12-in. breech-loading rifles, mounted in pairs, in two Hichborn elliptical balanced turrets on the middle line; sixteen 6-in. rapid-fire guns, mounted in broadsides, eight 14-pounders, eight 3-pounders and eight 1-pounders and machine guns. There are two submerged torpedo tubes, the Maine class being the first of the battleships in which the tubes have been placed below the water line.

Steam will be supplied by water tube boilers, the Maine class being the first of the United States battleships for which such an equipment was authorized. The Maine boilers will be of the Niclausse type. The boilers are designed to carry a working pressure of 256 lbs. to the square inch above the atmosphere. They are calculated to give 16,000 H.P. The ship will have twin screws, and her two main engines will be triple expansion, of inverted vertical type. The speed of the ship will be 18 knots.

Krupp armor will be used. The belt armor will extend 3½ ft. below the water line and 4 ft. above. It will be 11 in. thick at the top, 7½ in. at the bottom, and will extend to the bow, tapering, however, as it approaches the extremity to 4 in. The belt will extend to within 60 ft. of the stern. The casemate armor is to be 6 in. thick, the barbettes 12 in. at the front and 8 in. at the back, and the turrets 12 in. Forward the protective deck will be 2½ in. thick, while aft, where there is no armor belt, it is thicker, being 4 in. on the slope and 3 in. on the flat. The Maine will be fitted as a flagship, and will have a complement of forty officers and 511 men.

The Maine's boilers are already built and her engines are far advanced. Once afloat it will not take long to place all of her ponderous machinery in the hull. The placing of the armor plate and the setting up of the battery will take more time. Unless, however, unforeseen delays should occur, next summer will see the great vessel steaming on her official trial.

LAUNCH OF BATTLESHIP CORNWALLIS.

Last week the first-class armored battleship Cornwallis, which compares with the Georgia class of American battleships, was launched at the Thames Iron Works, Ship Building & Engineering Co., Blackwall, England. The Cornwallis is one of six vessels of the Duncan class. The armor is of Krupp cemented steel, but of English make. The side protection consists of a belt which extends from the stem to within 140 ft. of the stern. The belt is 14 ft. in maximum depth. It is 7 in. thick amidships, and tapers to 3 in. thick at the fore end. It has a vertical extension of 5 ft. below the water line and 9 ft. above at the designed load draught, being carried to the height of the main deck for a length of 266 ft. Between the armor deck and the belt deck there is a screen bulkhead aft, which joins the after barbette to the side armor, and abaft this we have 1½ in. mild steel plating in three thicknesses. The armored deck is arranged according to the principle now adopted in ships of this class, its sides meeting the lower edges of the belt. It has sufficient curve to rise 2 ft. 6 in. above the water line amidships, and is 1 in. thick. The main deck is 2 in. thick over the citadel, thus adding to the protective features. The two barbettes are circular in plan, and are placed on the fore and aft center line. The armor on them has a maximum thickness of 11 in., and runs to a height of 3 ft. above the upper deck. There are eight watertight casemates on the main deck and four on the upper deck, all of Harveyed armor on the outside, and having armor-plating at the back to protect the guns' crews from explosive shells. The vessel is fitted with twin screws, the propelling engines being supplied by the company's works at Greenwich. They are triple-expansion engines, with four vertical cylinders, each of the collective power of 9,000 H. P., giving an aggregate of 16,000 H. P. The cylinders are 33½ in., 54½ in., and 63 in. in diameter, with a stroke of 4 ft., and the number of revolutions 120 per minute when developing 16,000 indicated H. P. There are two main condensers, having a cooling surface of 19,000 sq. ft. There are twenty-four Belleville boilers, having a total collective heating surface of 43,260 sq. ft., and a fire-grate surface of 1,375 sq. ft. The Cornwallis is fitted as a flagship, accommodation being provided for an admiral and officers, or a total complement of 776 officers and men. The dimensions are: Length over all, 429 ft.; length between perpendiculars, 405 ft.; breadth extreme, 75 ft. 6 in.; depth, top of keel to upper deck, 43 ft. 9 in.; draught of water, mean, 26 ft. 6 in.; displacement at that draught, 14,000 tons; indicated horse-power, 16,000 tons; speed, 19 knots. The armament includes the following: Four 12-in. breech-loading guns in barbettes, twelve 6-in. quick-firing guns in casemates; ten 12-pounder 12-cwt. quick-firing guns; six 3-pounder quick-firing guns; eight .303-in. machine Maxims; one 12-pounder, 8-cwt., for boats; one 12-pounder, 8-cwt., for field; four submerged torpedo-tubes.

THE NEW CHESTER WORKS—SEABOARD SHIP YARD NOTES.

A site for the new ship building plant that is to be erected at Chester has been selected. It comprises 200 acres on the Delaware river. The water has a depth of 26 ft. The Chester branch of the Philadelphia & Reading railway on one side of the property will connect it with the several large steel and iron works below. Senator William C. Sproul, who is one of the leading men in the new enterprise, says: "There will be nothing definite in the way of organization until September. I will not say as yet who are associated with me in the project, but I will say that the yard will be separate and distinct from every other yard in the country and the company will engage in the general construction of vessels."

A four-masted wooden schooner, the Jacob M. Haskell, was launched on Thursday of this week from the yards of Cobb, Butler & Co., Rockland, Me. The vessel's dimensions are: Length over all, 249 ft.; keel, 210 ft.; beam, 43.2 ft.; depth, 24.6 ft.; gross tonnage, 1,600. There are three full decks. The frame is of native hardwood and hackmatack, the ceilings, beams and outboard planking of yellow pine. Two of the lower decks are of yellow pine, the upper deck of native white pine. A novel feature of her construction is the absence of hanging knees. Instead she has 14-in. square shelf strakes with heavy braces which the owners claim is an improvement over old construction. She is built of the heaviest material throughout and is well fastened. The sails, anchors and windlasses are worked by steam. The vessel is equipped with patent stockless anchors made by the Baldt Anchor Works at Chester, Pa. There are two kedge anchors made by W. G. Alden of Camden. The schooner also has a Hyde engine and boiler and wrecking pump.

Mr. Robert C. Morris has organized the Gulf Coast Ship Building and Dry Dock Co. with the following officers: Robert C. Morris, president; S. D. Scudder, vice president; S. B. McConnico, second vice president and secretary; and W. D. Munson, treasurer. The New York offices of the company are at No. 31 Nassau street, New York.

The Pacific Ship Building Co., Marshfield, Ore., has on the stocks a four-masted wooden schooner, 186 ft. keel, 206 ft. over all, 40 ft. beam and 15 ft. depth of hold; also a steam schooner 134 ft. keel, 32 ft. beam and 10 ft. depth. The first will be launched in August and the second in September.

The Chester Shipping Co., Chester, Pa., has placed a contract with Roach's Ship Yard for the construction of a new freight steamer for service between Chester and Philadelphia. The new vessel will be 127 ft. long and 15 ft. beam and will be used in river freight service.

Hall Bros., Port Blakely, Wash., have under construction a four-masted wooden schooner of 194 ft. keel, 41 ft. beam and 16 ft. 8 in. depth of hold. The company also has a contract for a five-masted schooner of 203 ft. keel, 42 ft. beam and 18 ft. depth.

The schooner El Dorado was launched at Cousins & McWhinney's yard at Aberdeen, Wash., recently. The vessel is 211 ft. over all, 40 ft. beam and 14 ft. depth of hold. Saunders & Kircham of San Francisco are the owners.

The keel of a new lumber schooner is about to be laid at Cousin & McWhinney's ship yard, Aberdeen, Wash.

At J. Lindstrom's yard, Aberdeen, Wash., two wooden steamers and a schooner are on the stocks.

PRODUCTION OF PIG IRON, FIRST HALF OF 1901.

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in the first half of 1901; also complete statistics of the stocks of pig iron which were on hand and for sale on June 30, 1901. Following is the summary:

The total production of pig iron in the first half of 1901 was 7,674,613 gross tons, against 7,642,569 tons in the first half of 1900 and 6,146,673 tons in the second half. The increase in production in the first half of 1901 over the first half of 1900 was only 32,044 tons, but the increase over the second half of 1900 was 1,527,940 tons. Indications now point to a decreased production in the second half of 1901 as compared with the first half. The production in the first half of 1899, the boom year, was 6,289,167 tons, and in the second half it was 7,331,536 tons.

The production of Bessemer pig iron in the first half of 1901 was 4,582,187 gross tons, against 4,461,391 tons in the first half of 1900 and 3,482,061 tons in the second half.

The production of basic pig iron in the first half of 1901 was 645,105 gross tons, against 581,868 tons in the first half of 1900 and 490,508 tons in the second half.

The production of charcoal pig iron in the first half of 1901 was 194,231 gross tons, against 167,146 tons in the first half of 1900 and 172,728 tons in the second half. In addition there were produced in the south in the first six months of this year 17,979 tons of pig iron with mixed charcoal and coke.

The production of spiegeleisen and ferromanganese in the first half of 1901 was 135,920 gross tons, all made in New Jersey, Pennsylvania, Alabama, Illinois and Colorado, against 148,102 tons in the first half of 1900 and 107,875 tons in the second half.

The association's statistics of unsold stocks do not include pig iron sold and not removed from the furnace bank, or pig iron in the hands of creditors, or pig iron manufactured by rolling mill owners for their own use, or pig iron in the hands of consumers. The stocks which were unsold in the hands of manufacturers or their agents on June 30, 1901, amounted to 372,560 tons, against 442,370 tons on Dec. 31, 1900, and 338,053 tons on June 30, 1900.

Included in the stocks of unsold pig iron on hand on June 30, 1901, were 8,831 tons in the yards of the American Pig Iron Storage Warrant Co., which were yet under the control of the makers, the part in these yards not under their control amounting to 1,569 tons, which latter quantity, added to the 372,560 tons above mentioned, makes a total of 374,129 tons which were on the market at that date. The total stocks in the above named warrant yards on June 30, 1901, amounted to 10,400 tons, against 16,400 tons on Dec. 31, 1900.

The whole number of furnaces in blast on June 30, 1901, was 259, against 232 on Dec. 31, 1900, and 283 on June 30, 1900.

For navigation charts apply to the Marine Review.

GROWTH OF TRADE WITH JAPAN.

The remarkable growth in the exports of the United States to Japan and in the rank which she now holds in supplying the imports of that prosperous and rapidly developing country is shown by some figures just compiled by the treasury bureau of statistics. The Japanese statistical report, entitled "Annual Return of the Foreign Trade of the Empire of Japan" has just been received by the treasury bureau of statistics, and presents the details of the imports and exports of Japan in the calendar year 1900. It shows that the imports from the United States have grown from 6,000,000 yen in 1893 to over 60,000,000 yen in 1900, and that the United States, which stood sixth in rank in the list of countries from which Japan drew her imports in 1893, is now second in the list, being only exceeded by Great Britain. In 1893 the imports into Japan from Great Britain were valued at 27,929,628 yen; those from China, 17,095,074 yen; from Hongkong, 8,268,071 yen; from British India, 8,679,029 yen; from Germany, 7,318,133 yen; and from the United States, 6,090,208 yen. In 1900 the list stood: From the United Kingdom, 71,638,219 yen; from the United States, 62,761,196 yen; China, 29,960,740 yen; Germany, 29,199,695 yen; British India, 23,516,350 yen; Hongkong, 10,659,855 yen; France, 8,095,819 yen; and Belgium, 1,949,253 yen. In 1893 the United States supplied 7 per cent, Germany 9 per cent., and the United Kingdom 32 per cent. of the total imports into Japan; in 1900 the United States supplied 21 per cent., Germany 10 per cent., and the United Kingdom 25 per cent. Going still further back, it may be said that in 1881 the United States supplied 6 per cent. and the United Kingdom 52 per cent. of Japan's imports; while, as above indicated, the United States now supplies 21 per cent. and the United Kingdom 25 per cent.

The late W. E. Fitzgerald of the American Ship Building Co. had the happy faculty of playing while he worked. Nobody suspected him of sentiment, and yet it is said of him that notwithstanding his business travels, away from home more than half the time, he managed to spend, wherever he was, five minutes with his family—his wife and boys. He did it by means of the long distance telephone. At a certain hour each evening, no matter how far away from Milwaukee he might be, his home was called up for a short talk with mama and the children.

Lieut. Col. Thomas H. Handbury, engineer of the eleventh lighthouse district, with headquarters at Detroit, has been ordered to Cincinnati where he will act as division engineer of the central division. The order takes effect Nov. 1.

Special local sleepers.—Train leaving Cleveland at 7:50 p. m. for Chicago, return trip leaving Chicago at 8:35 p. m., via the Nickel Plate road, now carries extra local sleepers between these points affording ample room for all. For specific information call on nearest agent or E. A. Akers, C. P. & T. A., Cleveland, O. 145, Aug. 17.

THE GUARDIAN TRUST COMPANY,

108 SUPERIOR STREET, CLEVELAND, O.

OFFERS SUBJECT TO PRIOR SALE

$150,000

First Mortgage 5% Gold Bonds

—OF—

The Calumet Transportation Co.

secured by "Blanket" Mortgage upon the new Steel Steamers

G. A FLAGG, RANDOLPH S. WARNER,

each 336 ft. length, 42 ft. beam and 26½ ft. depth,
and upon new Steel Schooners

A. W. THOMPSON, S. D. WARRINER,

each 300 ft. length, 42 ft. beam, 24 ft. depth.
Combined capacity of four vessels, 18,000 tons.

$633,000

First Mortgage 5% Gold Bonds

—OF—

THE GLOBE STEAMSHIP CO.

secured by "Blanket" Mortgage upon the new Steel Steamers

NEPTUNE, URANUS,
VENUS, MARS,
SATURN, JUPITER,

each 366 ft. length, 48 ft. beam, 28 ft. depth, and of 6,000 tons capacity.

These bonds are secured by mortgage or deed of trust to the Guardian Trust Co., as Trustee, in the one case upon two modern, new steel steamers and two new steel schooners, and in the other case upon six modern, new steel steamers, the insurance upon which, payable to and deposited with the trustee in the interest of the bondholders, exceeds in each case the total bond issue. The bonds mature in annual installments and as no part of the mortgaged property can be released until every bond is paid, the margin of security constantly increases.

As the bonds mature in yearly installments from 1902 to 1913, either long or short time securities can be furnished to suit purchaser.

Both bonds and semi-annual interest coupons are payable at office of The Guardian Trust Co., Trustee.

Prices to net the investor 4¾ %. Special descriptive circular upon application.

ENCROACHMENTS UPON BRITISH SHIPPING.

"Two important official returns relating to the mercantile marines of the world have just been issued, and in view of the optimistic tone of a portion of the president of the board of trade's address at Liverpool they have a special interest," says the Glasgow Herald. "From one of them, prepared by Lloyd's Register of Shipping, we get some up-to-date statistics of the tonnage of each of the great maritime countries. The other, which comes from the board of trade, deals professedly with the 'Navigation and Shipping of the United Kingdom for 1900,' but it also enables us to ascertain how far the carrying trade of Great Britain is shared in by foreigners. According to Lloyd's, the total British tonnage is going down instead of up. Last year at this time it was rather over 15,000,000 tons; now it is 14,708,206. This falling off may be accounted for in two ways. In the first place, our ship owners have of late been disposing abroad of a good many of their obsolete vessels, and, in the second, they have replaced many of their sailing vessels by steamers. The steam tonnage may not bulk so large as the sailing tonnage, but it is much more effective. Notwithstanding the diminution referred to, our total tonnage is still nearly equal to that of the whole of the rest of the world. The actual figures are: British tonnage, 14,708,206; foreign tonnage, 15,892,304. Total world's tonnage, 30,600,510.

"If we take steam tonnage alone the predominance of this country is still more strongly marked, the relative figures being 12,739,180 and 12,269,702. As regards foreign tonnage, it is impossible to overlook the manner in which Germany is coming to the front. Not so many years ago the merchant fleet owned by her lagged a long way behind that of America and some continental powers. The United States continues, on account of its large coastwise shipping interests, to hold the place next our own with a tonnage of 3,077,344, but the Germans are so rapidly challenging that superiority that they now can boast of a tonnage of 2,905,782. Norway, which comes next, has only 1,627,220 tons, while France has 1,406,883 tons and Italy 1,117,538 tons. No other nation possesses a tonnage which touches the million. There is one further respect in which the shipping enterprise of Germany shines. As these are the days of ocean leviathans, the countries which construct most of them may, to a certain extent, depend on obtaining the lion's share of the carrying trade of the world. At the present moment there are in existence exactly sixty steamers of 10,000 tons and upwards. How are these distributed? The United Kingdom owns twenty-nine and Germany twenty-five, while only four can be claimed by America and two by France.

"When we turn to the board of trade report is is found that in many respects the facts there disclosed are the reverse of satisfactory. Though the total volume of our shipping trade was larger in 1900 than in 1898, it showed a considerable decrease as compared with 1899. Nor is that the worst of the matter. The difference between the returns for the last two years is entirely due to a diminution in the entries and clearances of British vessels at our ports. Foreign tonnage advanced largely in 1899 as against 1898, and it continued to do so in 1900. On these points the following plain figures tell their own story regarding the total tonnage of vessels that entered and cleared with cargoes and ballast at ports in the United Kingdom from and to foreign countries, British possessions and coastwise, the figures given being in tons:

	Total trade of United Kingdom.	In British vessels.	In foreign vessels.
1900	208,777,928	167,112,552	41,665,376
1899	209,348,081	172,635,394	36,712,687
1898	200,848,056	169,949,278	30,898,778

"While, therefore, the proportion of the total trade of United Kingdom ports carried by British vessels went up by some 3,000,000 tons in 1899 as compared with 1898, it fell more than 5,000,000 tons in 1900. On the other hand, the proportion carried by foreign vessels advanced steadily, going up about 6,000,000 tons in 1899 and 5,000,000 tons last year. The same remarks apply to the total trade confined to steamers alone, as distinguished from sailing vessels, and also to the foreign trade of the country:

	Foreign trade of United Kingdom.	In British vessels.	In foreign vessels.
1900	98,523,693	62,710,836	35,812,857
1899	97,782,887	65,648,989	32,133,898
1898	90,963,966	64,216,728	26,747,238

"Regarding this expansion of tonnage in our foreign trade by vessels other than those of British nationality, it is specially noteworthy that the Germans again carry off the palm. In 1898 the German vessels trading to and from the ports of the United Kingdom represented a tonnage of little more than 4,500,000. By 1899 this had increased to 5,549,000, and last year it amounted to upwards of 6,000,000 tons. Explain it as we may, the fact remains that the mercantile marine of the Kaiser is not merely extending its operations in connection with the foreign trade of the Fatherland, but is more and more encroaching upon the commerce of British ports. This significant circumstance does not appear to be known to the president of the board of trade, though the figures are those of his own department, but it should engage the attention of the select committee now inquiring into the system of shipping subsidies."

$13.50 TO ATLANTIC CITY, N. J., AND RETURN.

From any point on C. T. & V. R. R., July 18 and August 15. Tickets good twelve days and for return will admit of stop-over at Washington on return trip. Apply to any agent, or J. E. Galbraith, traffic manager, C. T. & V. R. R., Cleveland, O. Aug. 8.

Pan-American exposition rates to Buffalo via the Nickel Plate road—Tickets now on sale at all stations, one and one-third fare for round trip, good returning fifteen days. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, Ohio. 85, Aug. 1.

BELLEVILLE GENERATORS

Grand Prix 1889 — Hors Concours 1900
Originated 1849 — Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890	67,728	2,460										
1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68,379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68,766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.
TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

AROUND THE GREAT LAKES.

Notice has been received that the gas buoy on Gull island shoal, Lake Erie, was relighted on July 29.

A wooden tug building at Sturgeon Bay, Wis., for Smith Bros. of Waukegan, will be completed shortly. The vessel is 73 ft. long and 15½ ft. beam, and will cost about $7,000.

The story comes from Detroit that Mr. Lyman C. Smith of the Smith-Premier typewriter fame is to build ten freighters for lake service. Mr. Smith has done no figuring as yet with the American Ship Building Co.

Maj. Dan C. Kingman, the government engineer in charge of the Cleveland district, has ordered from the Detroit Motor Works, Detroit, Mich., a naphtha launch 34 ft. in length, 7 ft. beam, and 12 H.P., for use in the harbor about Cleveland.

The passenger steamer Easton, owned by the William Transportation Co., has been sold to Milwaukee parties and will be delivered to her new owners Sept. 1. The Easton was purchased from a company at Baltimore this spring and brought to the lakes.

The officials of the Northern Steamship Co. have seen fit to deny the story that the Northland and Northwest are to be used in the Chicago and Mackinac island service next year. The vessels will be continued in the Chicago-Buffalo service which has become quite popular.

Mr. Harry Rodgers, who is well known to patrons of both the Detroit & Cleveland and Cleveland & Buffalo steamboat lines, and who made a host of friends in Cleveland when connected with steamboat freighting business a few years ago, has decided, after an experience with the railroads, to return to the Cleveland & Buffalo company. He will take up the duties of general freight agent for that company Sept. 1 next.

The International Steamship Co. has sold the steamer Paraguay to eastern parties. The price paid is understood to be $250,000. The vessel will be fitted out as an oil carrier and will be turned over to her new owners on Oct. 1. She will need considerable refitting. A fore-and-aft bulkhead will be put in the vessel and two new pumps will be installed. She will be used in the Texas oil field service. The Paraguay went to the coast last fall but returned to the lakes last spring.

It is quite probable that the steel tow barge Sagamore, sunk above the Sault in a fog a few days ago by the Northern Steamship Co.'s steamer Northern Queen, will not be recovered, as she is said to be in more than 70 ft. of water. This is the first total loss of importance in the present season. The Sagamore and her steamer, the Pathfinder, were built in 1892 for Pickands, Mather & Co. of Cleveland and have been among the most successful vessels on the lakes.

In the last issue of the Review the length of the steamer Midland Queen, built in Scotland for James Playfair of Midland, Ont., and which will soon pass up the Canadian canals to enter into a general freighting business on the lakes, was given as 225 ft. instead of 255 ft. It is quite probable that in shipping circles the error was clearly one of the types, as it is well understood that a vessel designed to suit dimensions of the Canadian canal locks would not be made 225 ft. in length.

HOW TO WATERPROOF BLUE PRINTS.

As ship builders and men in the iron mining districts have a great deal to do with blue prints the following method of making them water proof will be read with interest, for who has not had to deal with a blue print blurred or discolored by rain? The water-proofing medium is refined paraffin and may be applied by immersing the print in the melted wax, or more conveniently as follows:

Immerse in melted paraffin until saturated a number of pieces of an absorbent cloth a foot or more square and when withdrawn and cooled they are ready for use at any time. To apply to a blueprint, spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flat-iron. The paper immediately absorbs paraffin until saturated and becomes translucent and highly waterproof. The lines of the print are intensified by the process, and there is no shrinking or distortion. As the wax is withdrawn from the cloths, more can be added by melting small pieces directly under the hot iron. By immersing the print in a bath of melted paraffin the process is hastened, but the ironing is necessary to remove the surplus wax from the surface, unless the paper is to be directly exposed to the weather and not to be handled. The irons can be heated in most offices by gas or over a lamp, and a supply of saturated cloths obviates the necessity of the bath. This process, which was originally applied to blue prints to be carried by the engineer corps in wet mines, is equally applicable to any kind of paper, and is convenient for waterproofing typewritten or other notices to be posted up and exposed to the weather.

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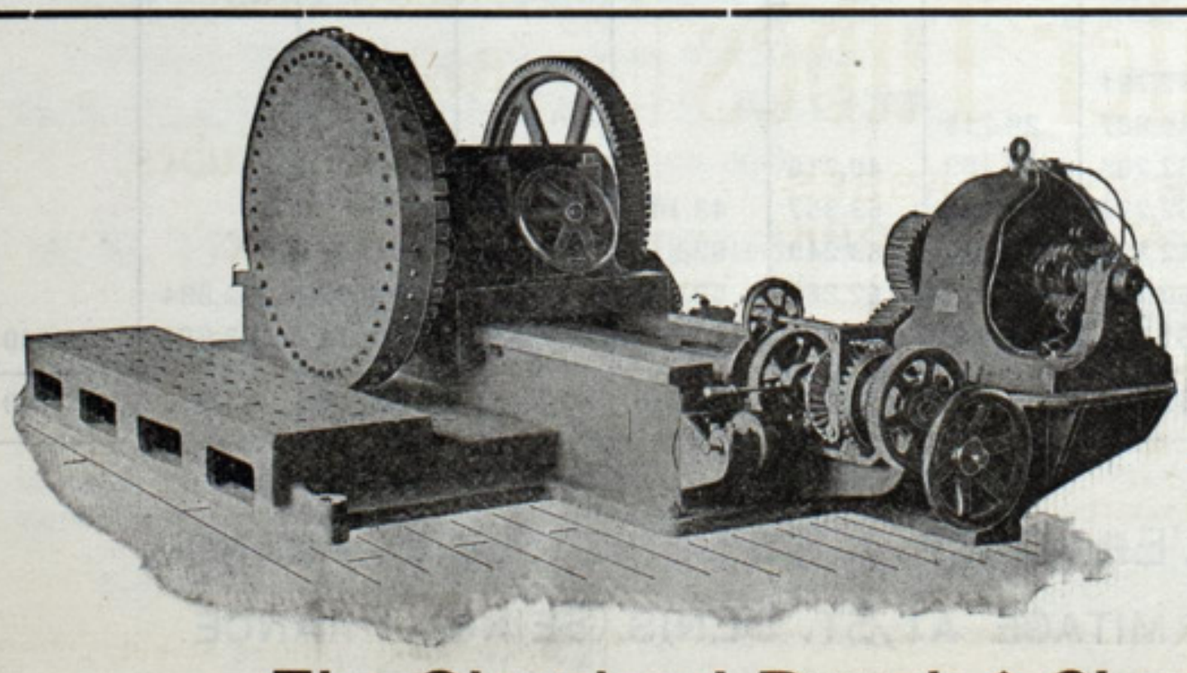

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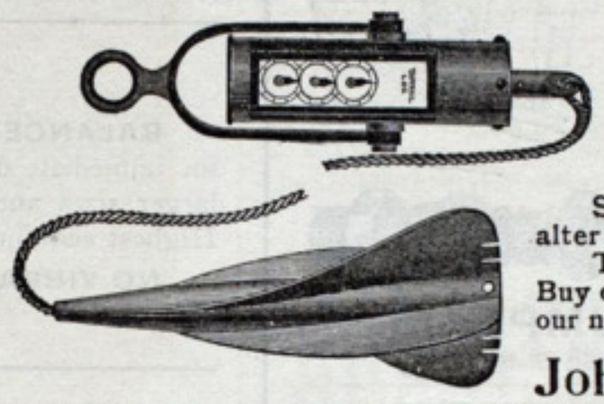

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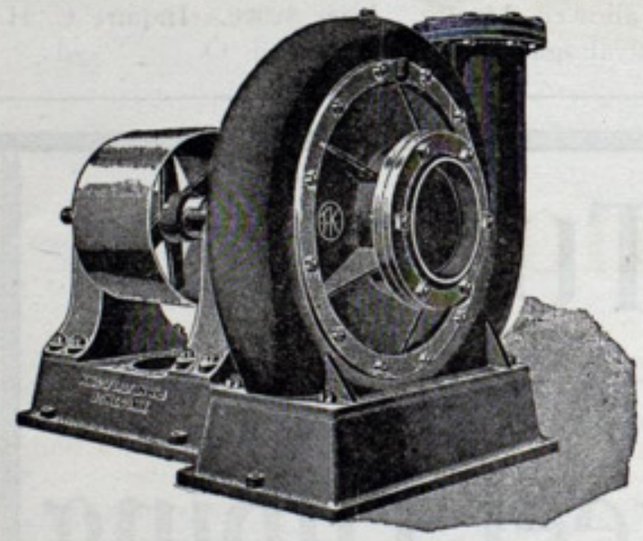

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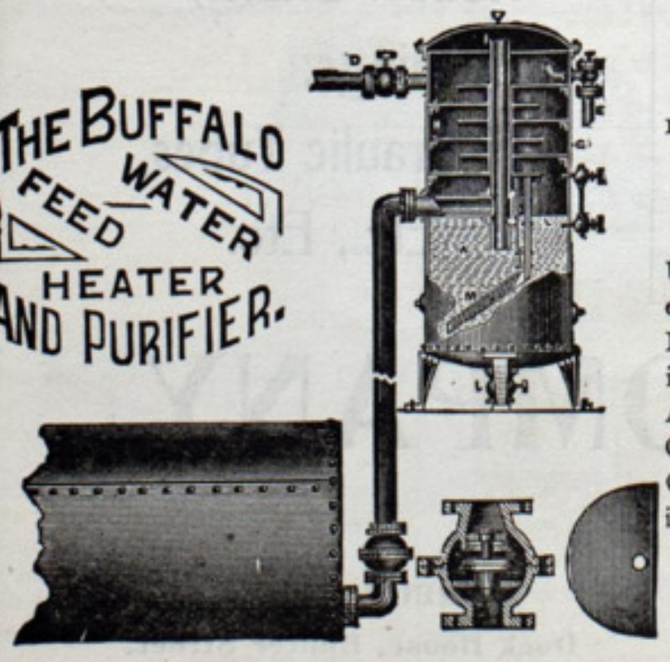

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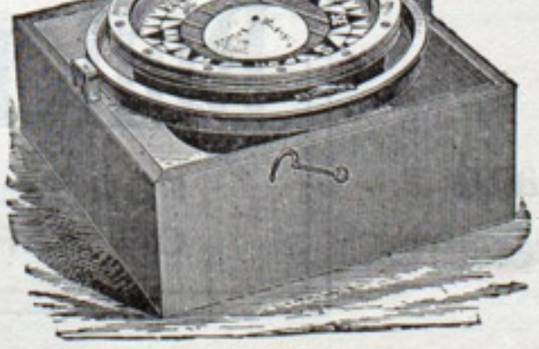

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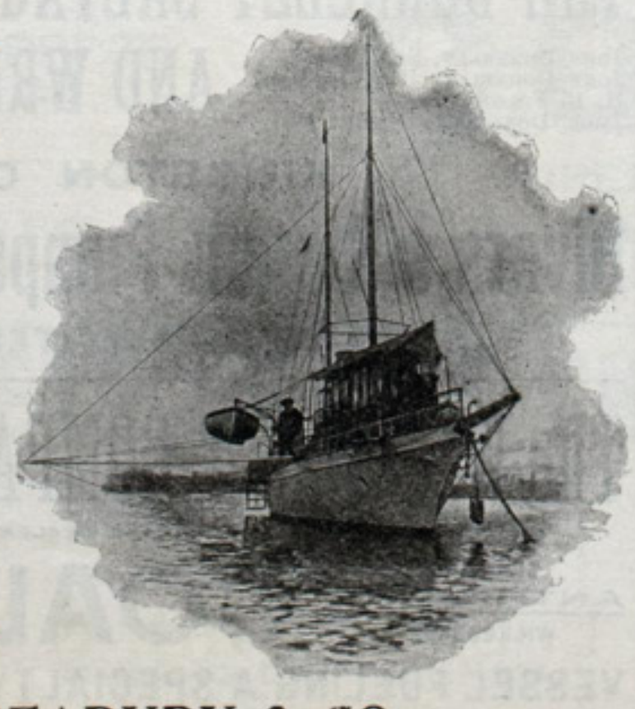

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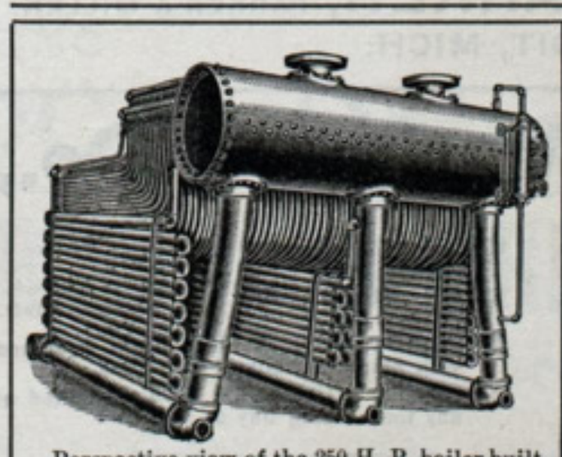

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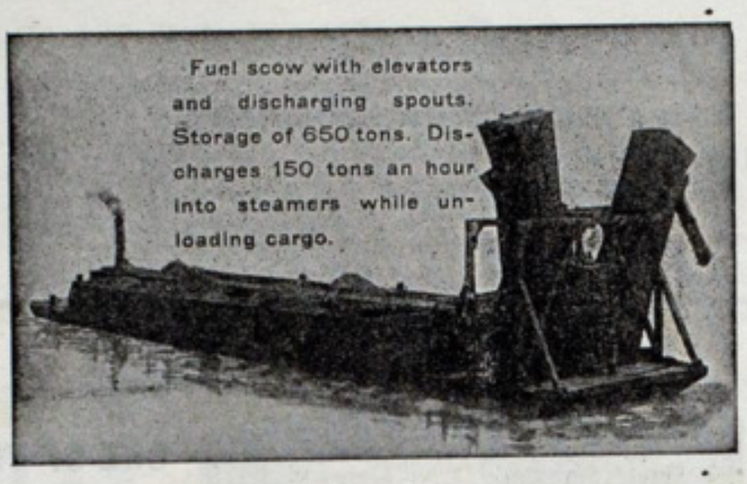

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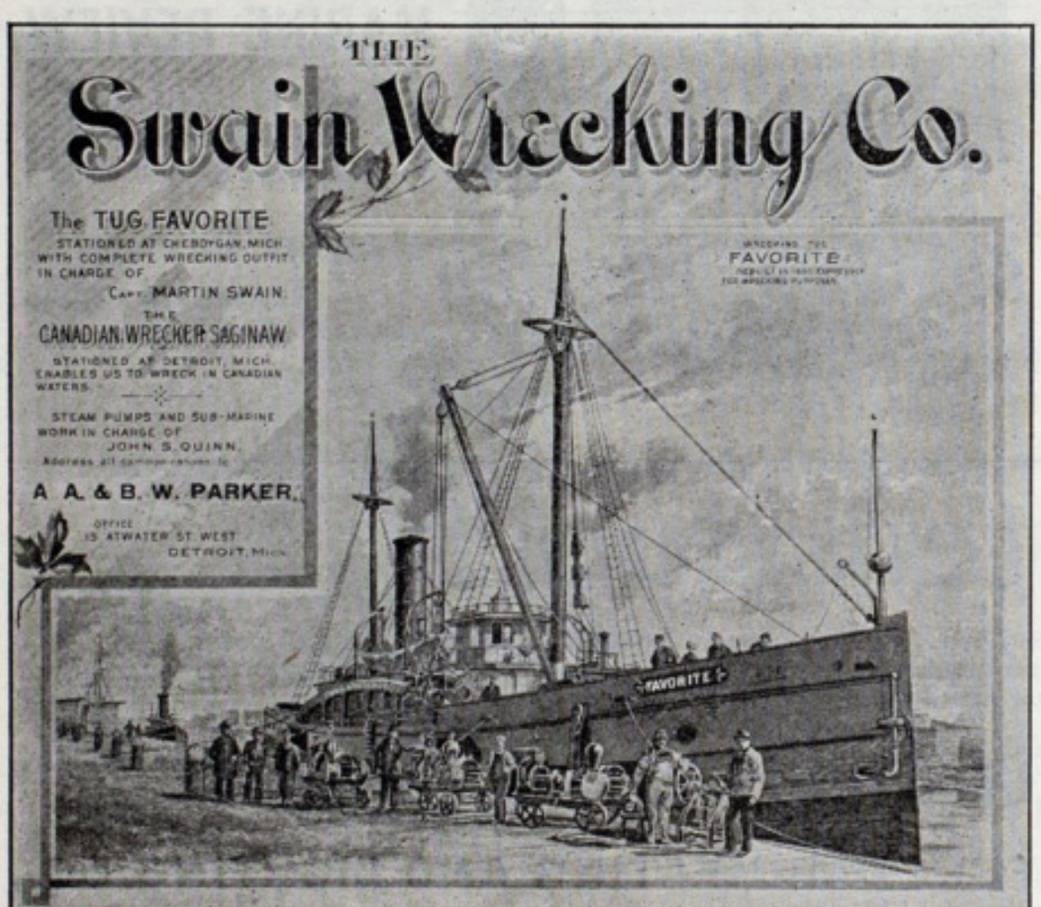

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Robins Conveying Belt Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.
Wood & Co., R. D.....Philadelphia.

CRANK PINS.

Cleveland City Forge & Iron Co.....Cleveland.

DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.

DRILL PRESSES—DRILLS OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

DRILLS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Sturtevant, B. F. Co.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Shipowners Dry Dock Co.....Chicago.
Union Iron Works.....San Francisco.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

ELECTRIC LIGHT AND POWER PLANTS.

Badt-Goltz Engineering Co.....Chicago.
Buffalo Forge Co.....Buffalo.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Reynolds, H. J.....Cleveland.

FIRE EXTINGUISHING APPARATUS.

Clayton Fire Extinguishing & Disinfecting Co.New York.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.

Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Ohio Fuel Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., The W. L.....Erie, Pa.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

IGNITERS FOR GAS ENGINES.
Holtzer-Cabot Electric Co.....Brookline, Mass.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.
Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.
Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Dominion Line .....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.
Colt Co. J. B.....New York.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

MORAN BROS. COMPANY

SEATTLE, WASHINGTON

SHIP AND ENGINE BUILDERS

STEEL AND WOOD VESSELS, STEAM OR SAIL
FOR OCEAN, SOUND AND RIVER SERVICE

FOUNDRY, MACHINE, BOILER AND FORGE SHOPS

LARGEST TOOLS AND EQUAL TO ANY REQUIREMENT
HEAVY FORGINGS A SPECIALTY

DRY DOCK AND MARINE RAILWAY

Two-Section balanced floating dry dock, 400 ft. long, 60 ft. between towers; patent steel wedge keel blocks; 12,000 tons displacement.
CAPACITY OF MARINE RAILWAY 1500 TONS

SHIP CHANDLERY, ENGINEERS' SUPPLIES

SAW AND PLANING MILL

CAPACITY: TIMBER, 48 INCHES SQUARE, 125 FEET LONG
including every description of ROUGH, DRESSED or KILN DRIED
YELLOW FIR, RED CEDAR OR SPRUCE
We make a specialty of long and large timber and can DRESS FOUR SIDES 20 x 30 INCHES.

SPARS THE LONGEST, LARGEST, CLEAREST AND BEST IN THE WORLD; ROUGH OR HEWN.
PILES OR TIMBER OF ANY DESCRIPTION.

CARS FROM ALL TRANSCONTINENTAL ROADS
ENTER OUR YARDS AND DOCKS
DOCK SHIPMENTS TO ALL PARTS OF THE WORLD

ELECTRIC CRANE Capacity to transfer 75 tons from car to vessel

WE INVITE CORRESPONDENCE

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CLEVELAND CITY TICKET OFFICE 237 SUPERIOR ST

Eastward:—	Ar. fr. West.	Dep. East.
No. 18, Southwestern Limited	.....	*1 55 am
No. 22, Lake Shore Limited	*2 15 am	*2 20 am
No. 26, Pan-American Express	*5 50 am	*6 00 am
No. 28, New York & Boston Express	*7 40 am	*8 00 am
No. 32, Fast Mail	*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky	†1 35 pm	.....
No. 46, Southwestern Express	.....	*3 00 pm
No. 6, Limited Fast Mail	*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special	*7 35 pm	*7 40 pm
No. 16, New England Express	*10 30 pm	*10 35 pm
No. 2, Day Express	†9 05 pm	†11 30 pm
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk	†10 00 am	†11 40 am
No. 106, Conneaut Accommodation	.....	†4 30 pm
Westward:—	**Ar. fr. East.**	**Dep. West.**
No. 11, Southwestern Limited	*3 25 am	.....
No. 15, New York, Boston & Chicago Special	*3 05 am	*3 10 am
No. 21, New York & Chicago Express	*5 10 am	*5 20 am
No. 7, Day Express	.....	†6 30 am
No. 19, The Lake Shore Limited	*7 35 am	*7 40 am
No. 23, Western Express	*11 10 am	*11 15 am
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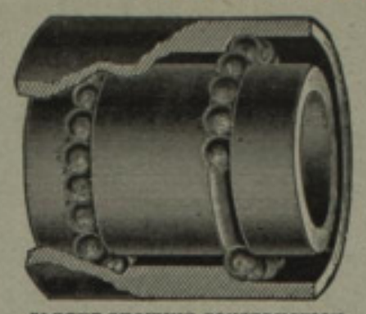

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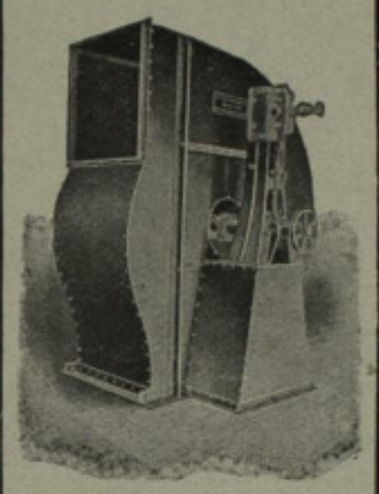

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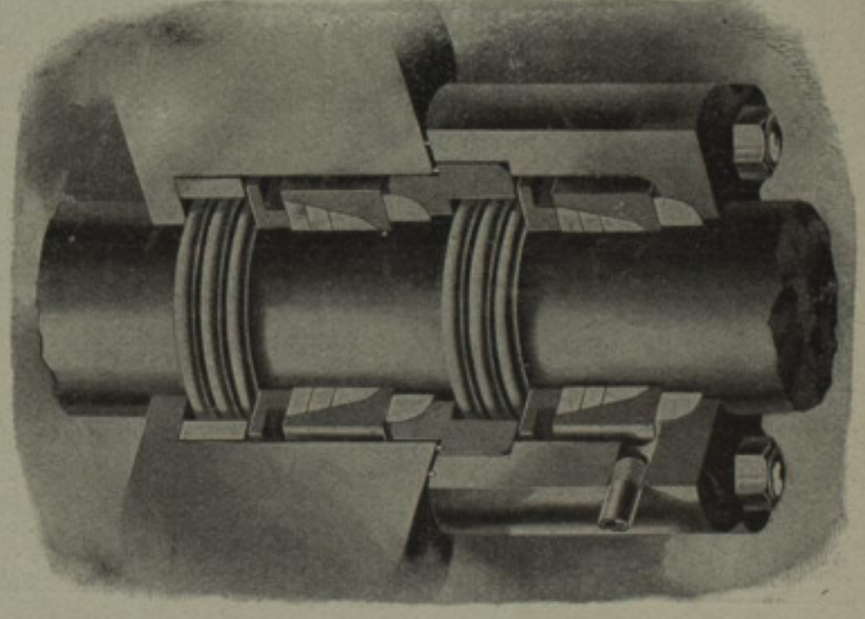

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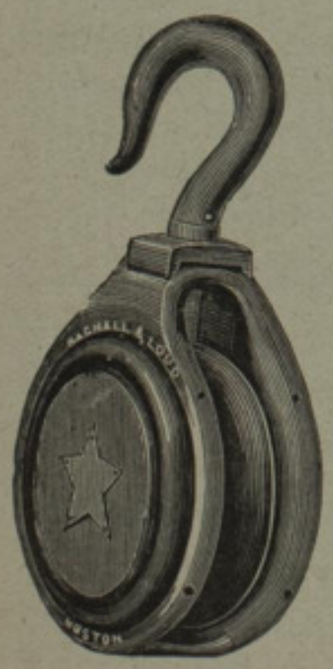

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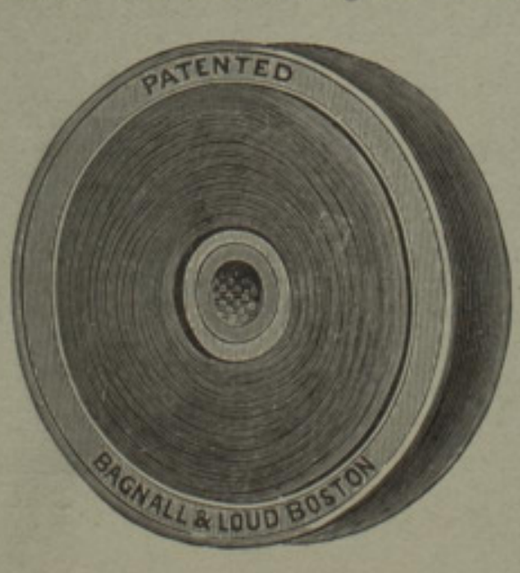

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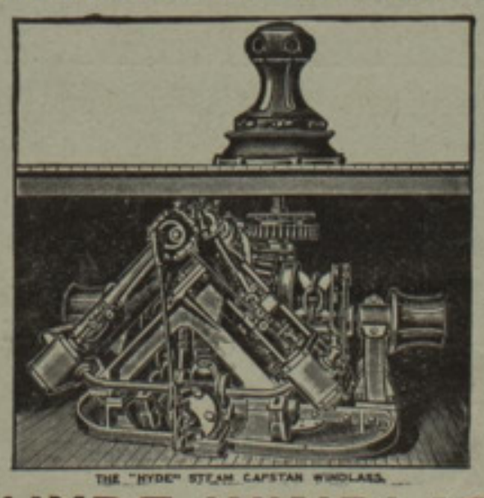

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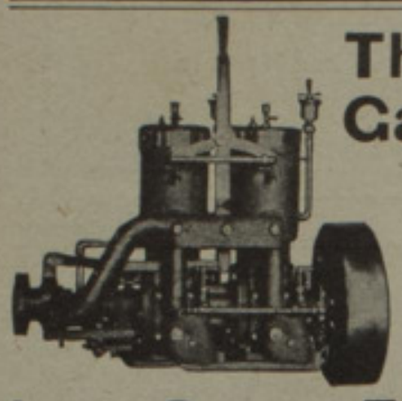

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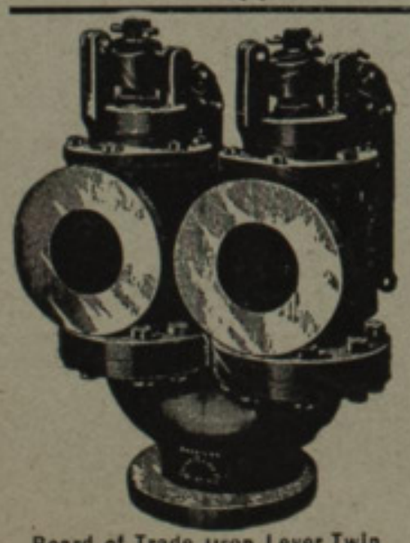

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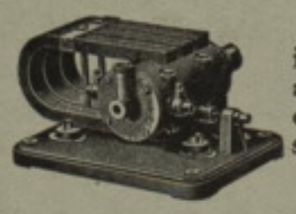

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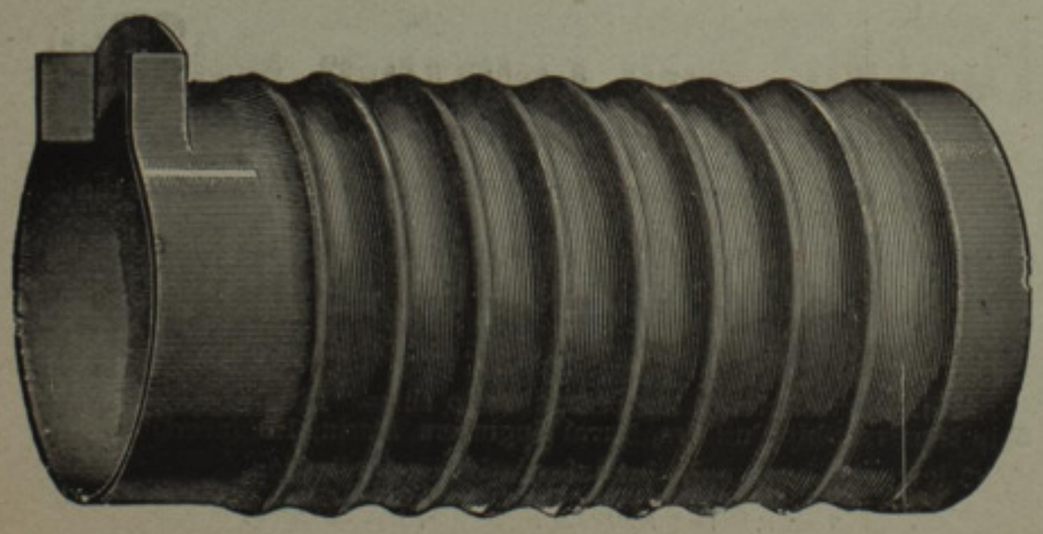

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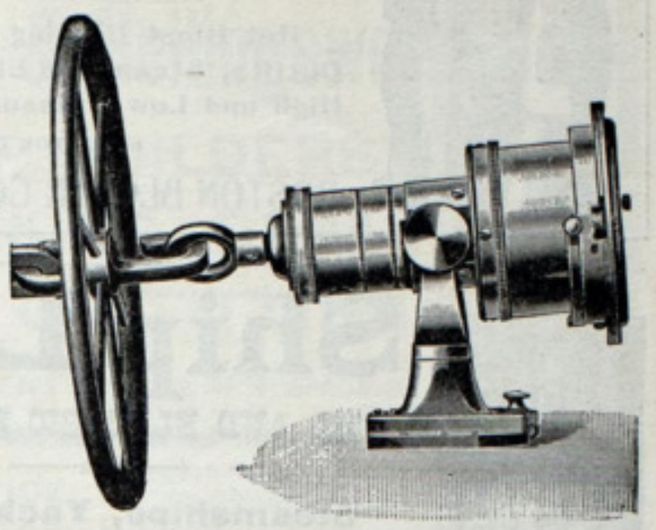

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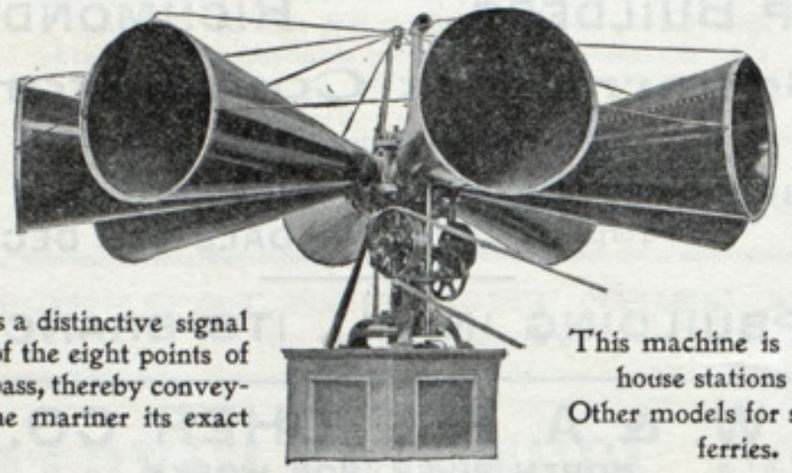

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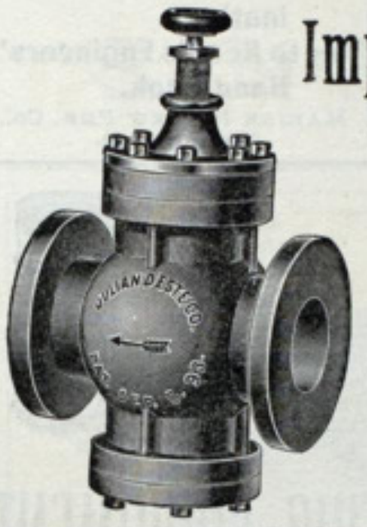

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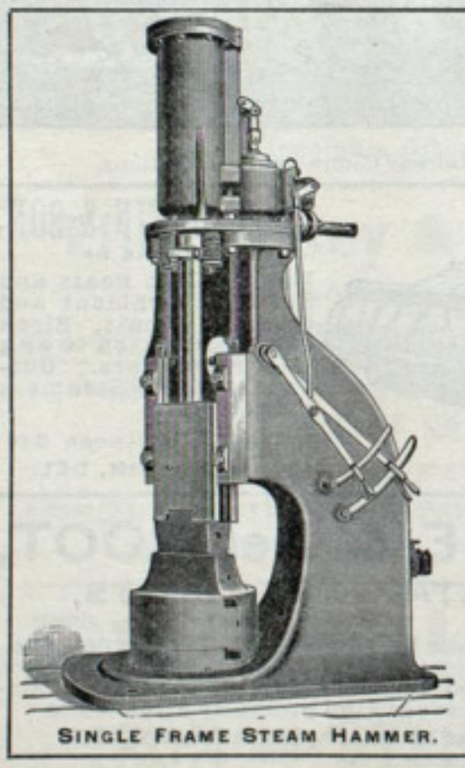

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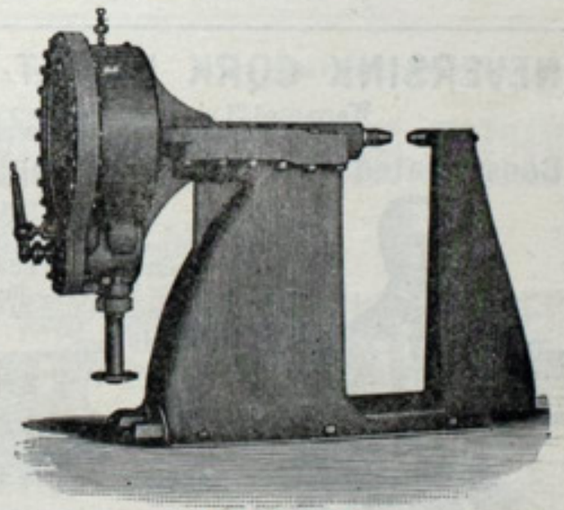

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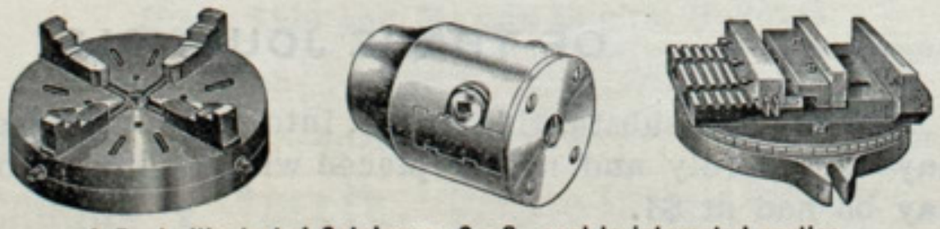

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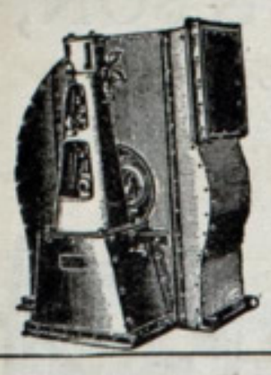

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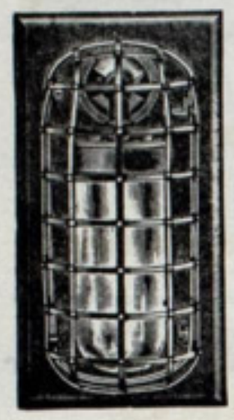

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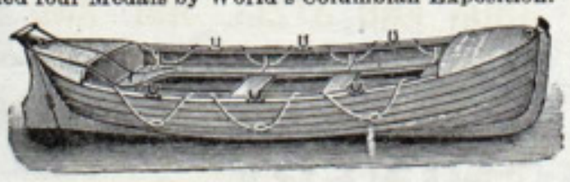

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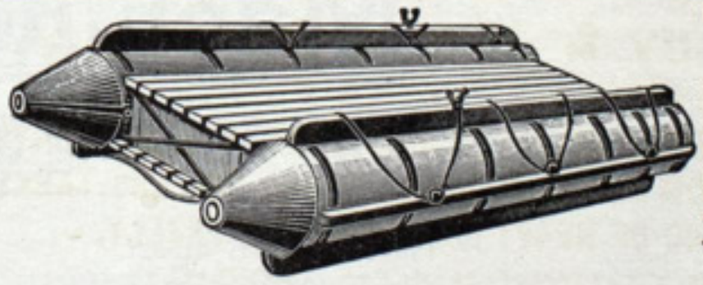

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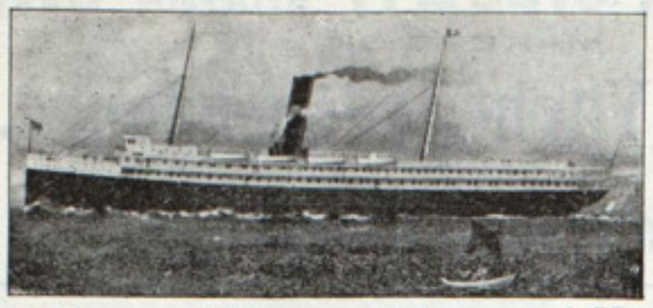

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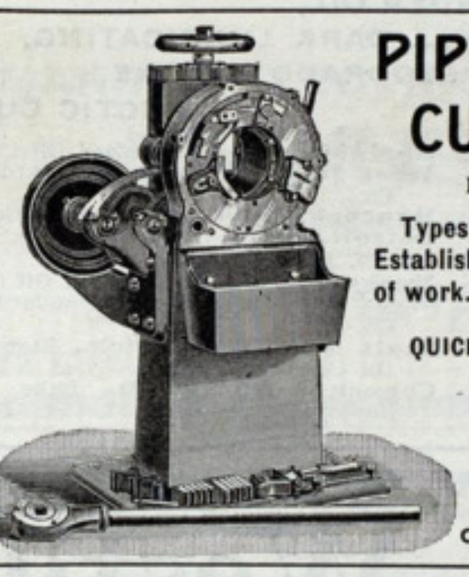

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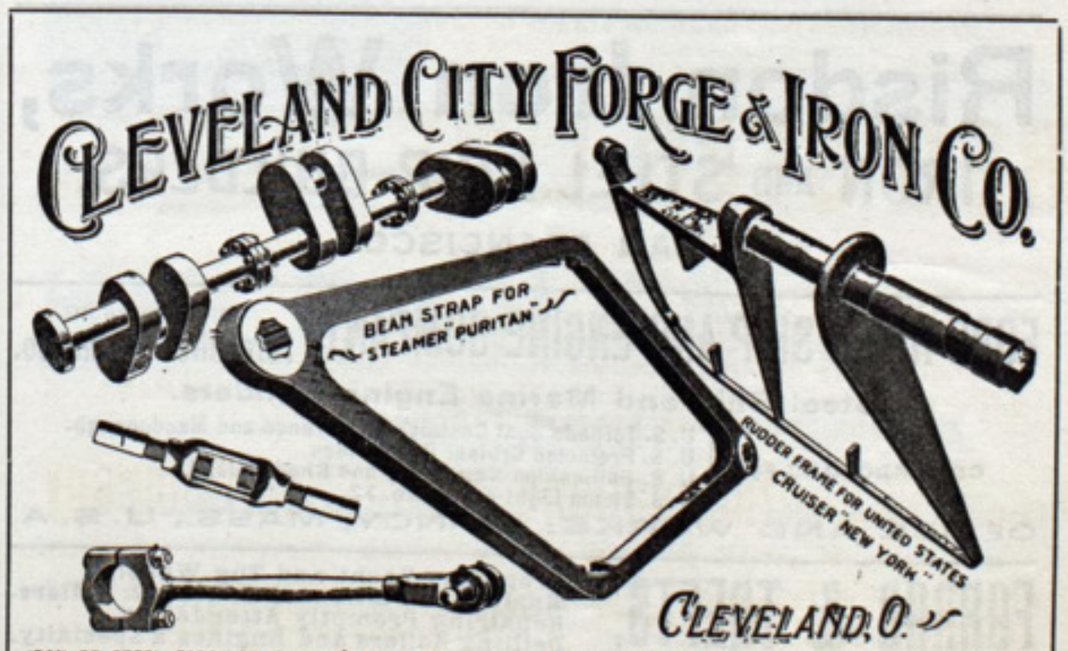

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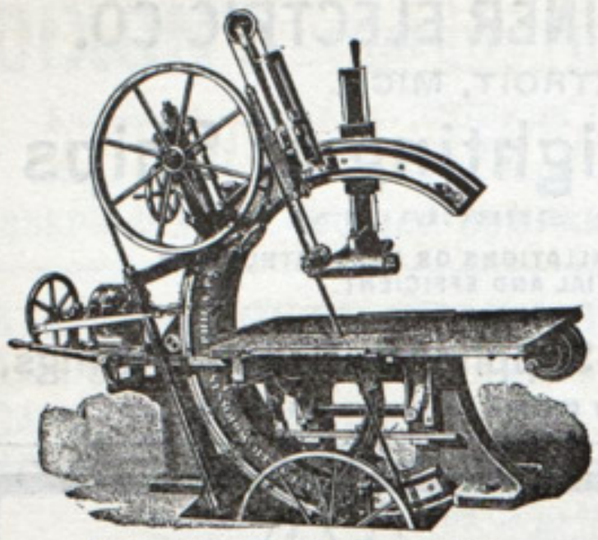

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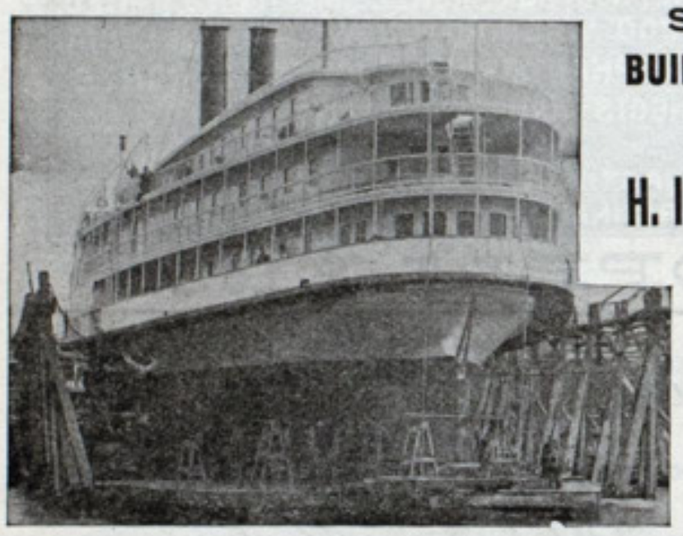

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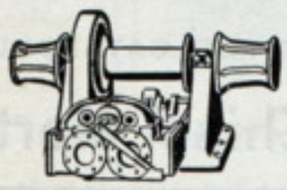

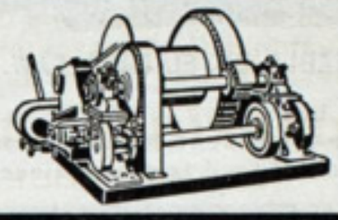

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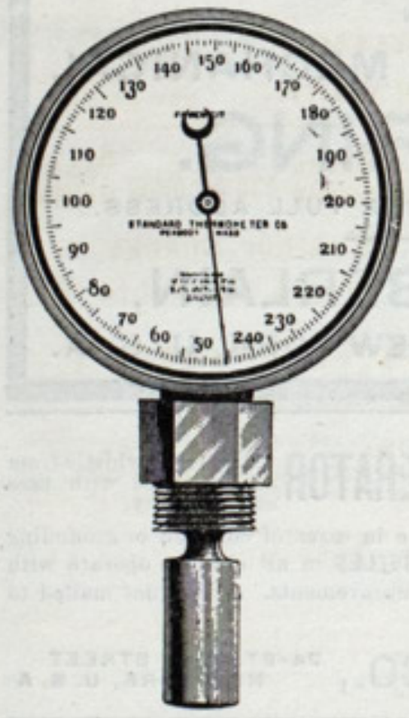

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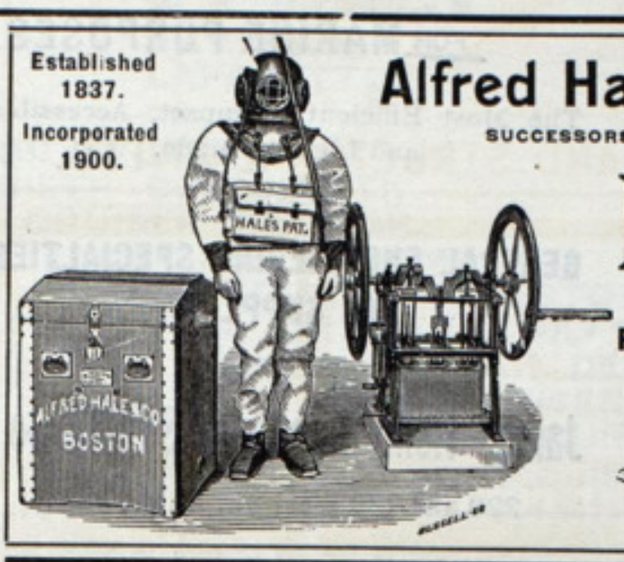

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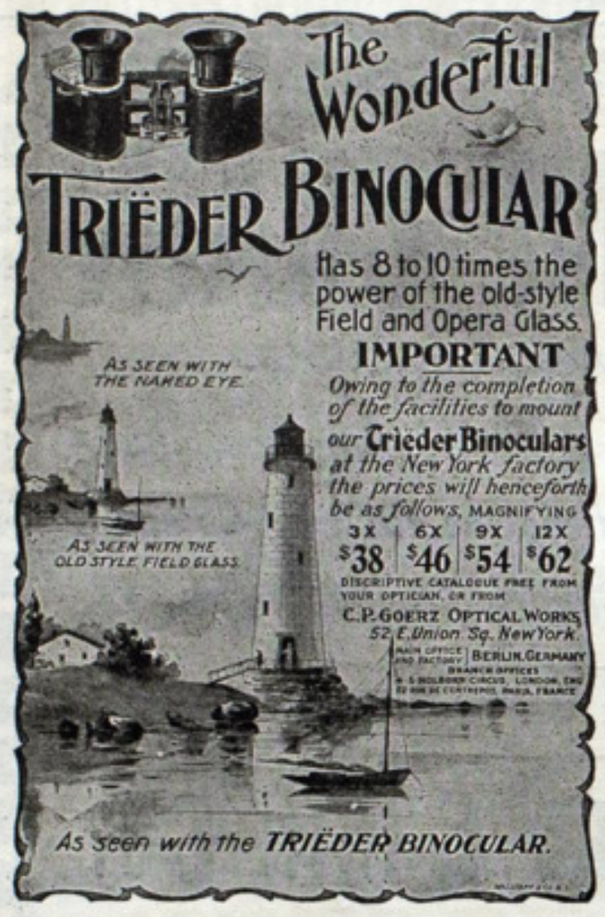

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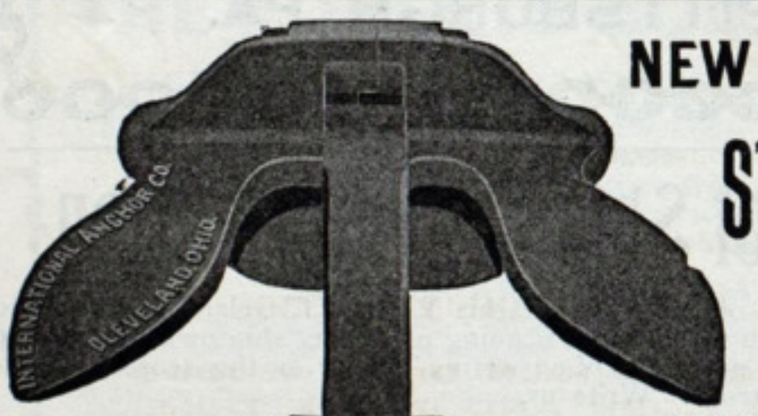

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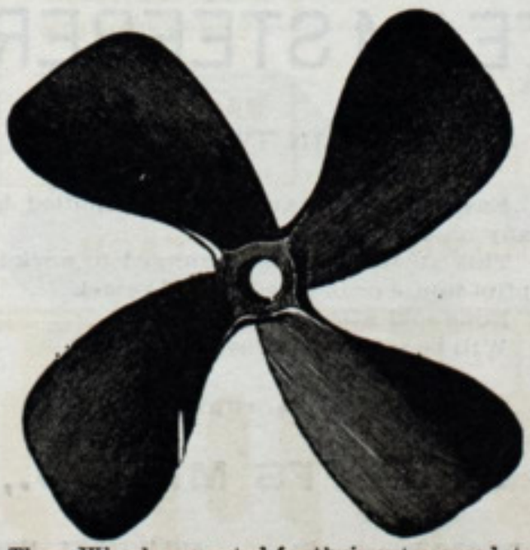

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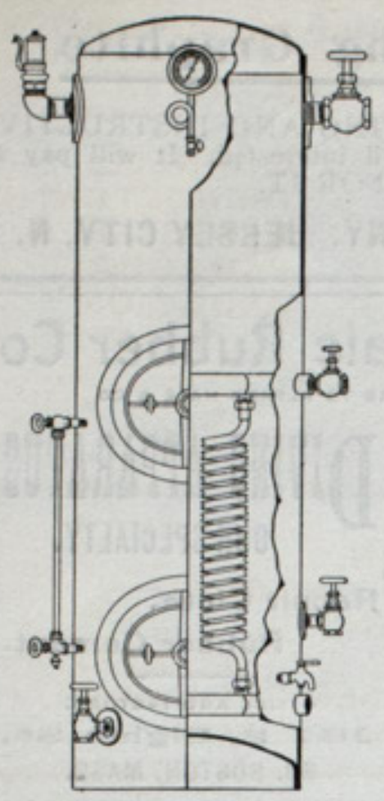

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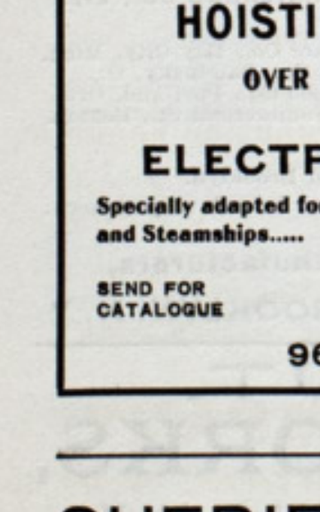

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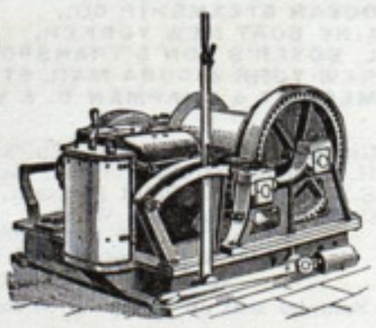

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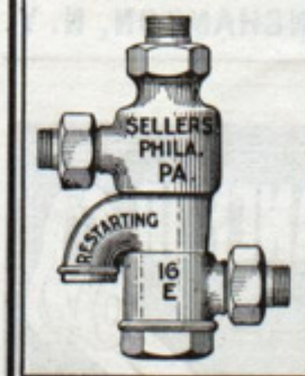

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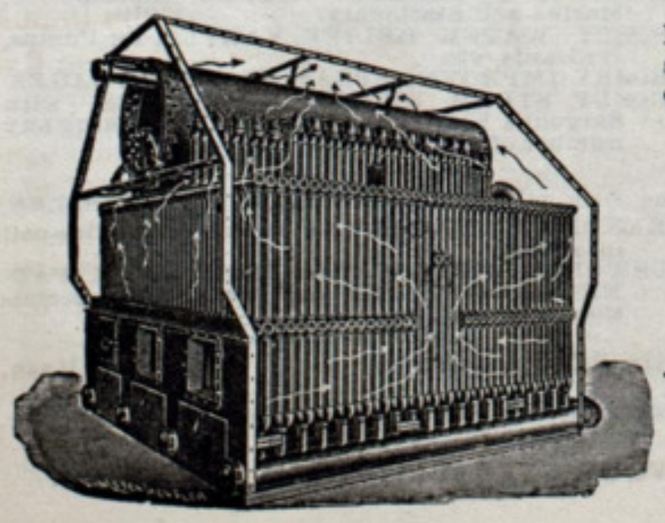

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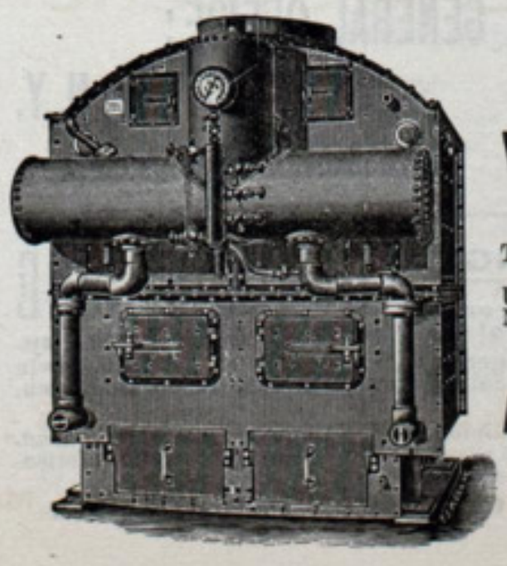

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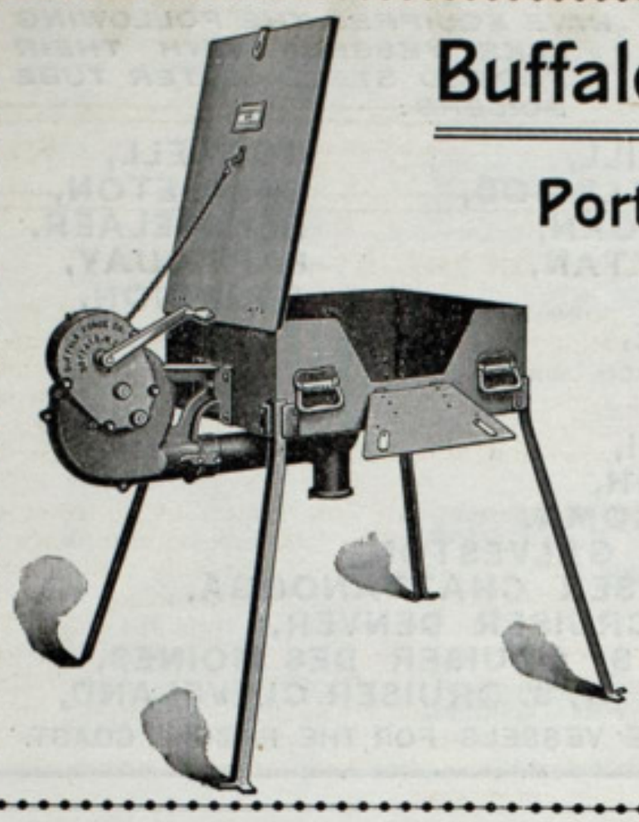

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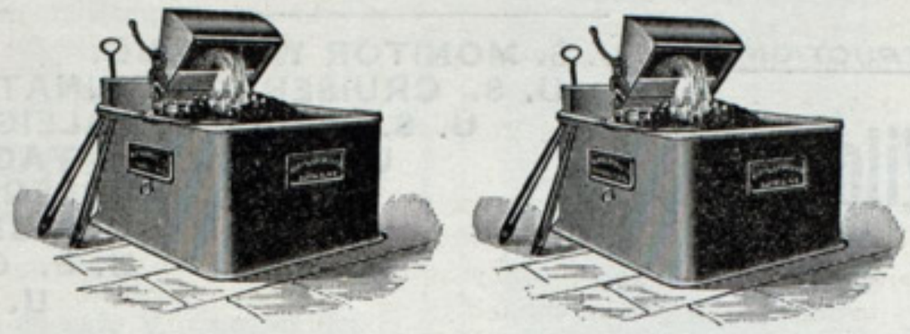

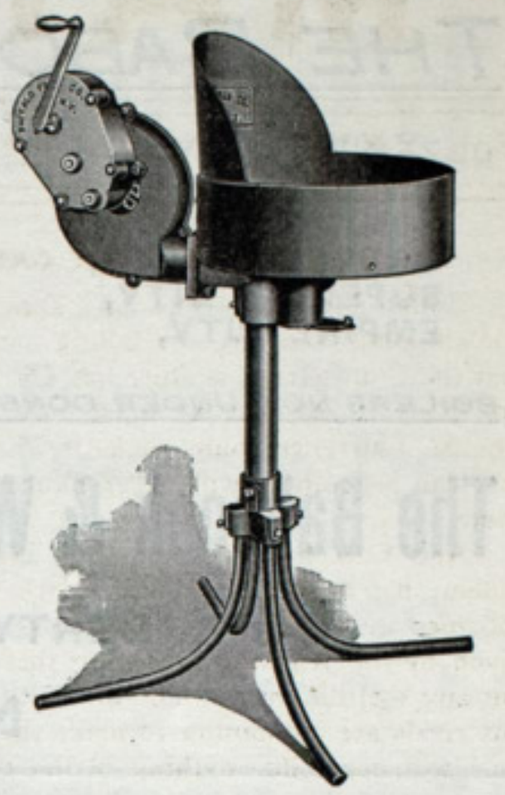

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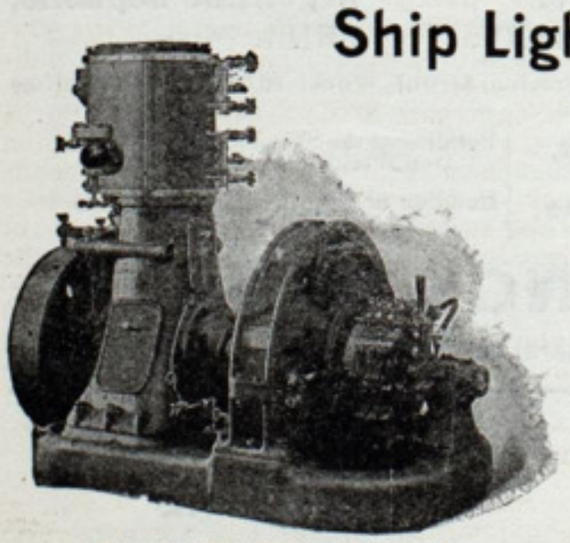

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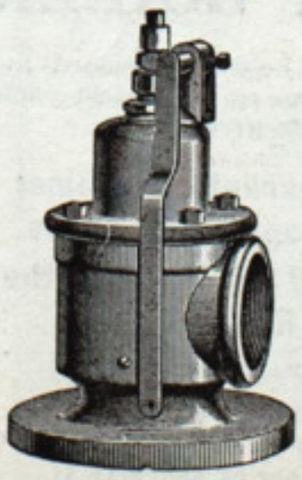

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